ELECTRICAL WORLD

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DECEMBER 5, 1931
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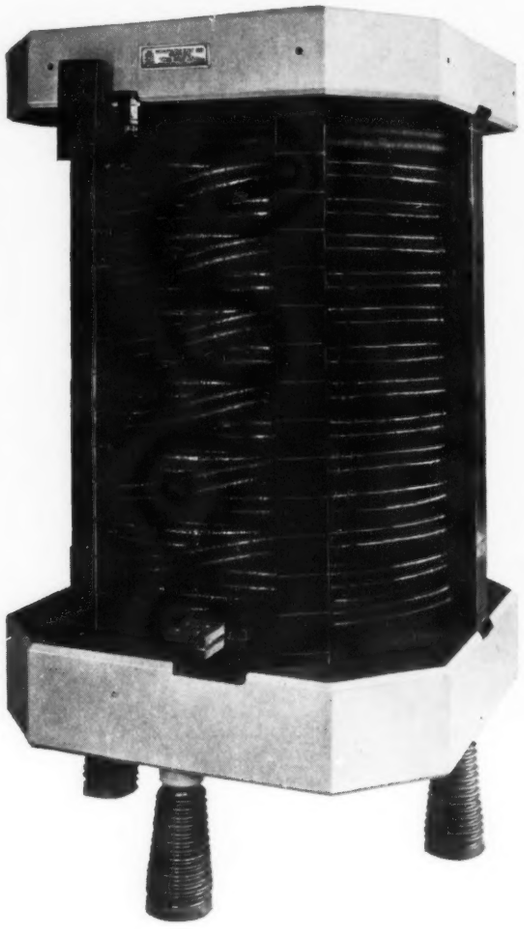

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FRANK R. INNES
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520 N. Michigan Ave.
Chicago
H. S. KNOWLTON
New England Editor
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Boston
WALTER C. HESTON
Pacific Coast Editor
883 Mission St.
San Francisco
PAUL WOOTON
Washington
Correspondent
National Press Building
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JAMES H. RUDD
Publishing Director

Model store
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ELECTRICAL WORLD

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for the Week Ending

December 5, 1931

Power Board seeks larger jurisdiction

—**Why not extend our powers?** Implicit and explicit both is this plea in the annual report of the Federal Power Commissioners, who have their eye both on interstate transmission and control of holding companies—*p. 982.*

—**Twenty-million-dollar budget** announced by the Philadelphia Electric Company for construction in 1932 puts that organization in the van of great light and power companies prepared to show they are not downhearted—*p. 983.*

It is not the crook in modern business that we fear, but the honest man who doesn't know what he is doing.

OWEN D. YOUNG.

Steam pressures and temperatures rise

—**High-pressure steam is topic** at A.S.M.E. convention. Ford's 1,400-lb. boilers and two experimental installations developing 3,500 lb. and 5,000 lb. respectively attract keen interest. Temperatures ranging up to 1,000 deg. also come in for notice—*p. 984.*

—**Investment bankers' report** recommends clearing up of misunderstandings by utilities, condemns complexity in balance sheets and capital structures and commends power-company executives for showing made under adverse conditions—*p. 1017.*

—**Fifteen years' steady progress** in the electrical manufacturing industry has brought uniform accounting and cost systems appreciably nearer. In this respect the N.E.M.A. has already been working zealously along the lines of industrial stabilization proposed by Gerard Swope—*p. 997.*

—**Network protectors can't think** and hence often function when they might better rest. A Westinghouse engineer explains the causes of this mechanical industriousness and tells how it may be curbed—*p. 1010.*

Safe Harbor ready to join hydro giants

—**Plant on Susquehanna River** with mile-long dam structure, of which power house is a part, includes Kaplan adjustable-blade turbines. Initial 220-kv. line to Baltimore is finished—*pp. 982, 992.*

—**Remote high-speed control** applied to starting grouped motors in a California industrial plant eliminates losses both of electrical energy and of time. Method is made clear—*p. 1000.*

Paul S. Clapp Resigns from N.E.L.A.

Federal Power Commission Suggests the Value of Extending Its Scope

GOING well outside of its own special province of protecting the nation's interest in hydro-electric development on navigable streams and government property, the Federal Power Commission, in its eleventh annual report, issued on Wednesday, December 2, expatiates on the growth of the power industry as a whole, prefacing its disquisition by the statement that "inasmuch as one purpose of the act is promotion of the development of water power, its administration must take cognizance of the industry's present-day status."

The commission's summary of the situation soon brings it to interstate transmission, on which, referring to its rapid increase, the report says:

Measured by quantity the interstate movement of electricity was almost twice as much last year as four years ago, although in percentage the increase seems less, the kilowatt-hours exported from state to state constituting 10 per cent of the total supply in 1926 and over 13 per cent in 1930. And this growth in the interstate business of the power industry may be expected to continue.

Although the practical development of electric power transmission is at present limited by physical and economic conditions to a few hundred miles, the larger systems are not adequately described as "regional" in geographic extent, for several systems comprise marketing areas within no less than five contiguous states. The geographic relations, then, are those determined by distance rather than by state boundaries, and the result is economic rather than political units. Along with this interlocking of operating companies and their affiliation as great systems, the interstate commerce in electricity has become national rather than regional in scope.

Transmission of electrical energy in wholesale quantities has been declared by the Supreme Court in the Attleboro case to be interstate commerce national in character and therefore beyond the regulatory power of the states, even in the absence of congressional action. It follows that, so far as wholesale interstate commerce is concerned, inasmuch as Congress has not occupied the field and the states are unable to occupy it, there is at present an area which is wholly uncontrolled. There are different estimates as to the size of this area, but it is clear that from the standpoint of quantity interstate transmission is of great importance and of wide diversity of importance as related to the several states.

Turning to the subject of holding companies, the report says, after referring to the independent study of economic structure that it has begun:

With many of the most important projects within the jurisdiction of this commission held by licensees which are controlled and in some instances closely managed by holding companies, the interest of the commission in the subject of holding companies is a natural one. Effective regulation of operating companies may be found to depend upon an extension of the commission's jurisdiction. . . .

To insure the collection of facts that will have a maximum usefulness a certain degree of federal leadership seems essential, in view of the national character which the power industry is so rapidly assuming. The rapidity with which regional systems have displaced local groupings points to the evolution of even larger units with physical interconnection and common control. It is this probability, which may involve a great potentiality of good or evil, that gives to the power situation its peculiar interest to the average citizen and makes public regulation both an economic requirement and a social necessity.

Advocating "publicity that educates the public" as an aid to effective regulation, the commission observes:

No single state is sufficient unto itself to undertake unaided the task of finding all the pertinent facts concerning the power industry and making them public. Co-operation under the leadership of a central agency like the Federal Power Commission promises the nearest approach to 100 per cent success. . . . The problem of administrative officers of the states and the federal government is so to administer overlapping laws or overlapping jurisdiction as to accommodate and harmonize such overlapping to avoid conflict which would defeat the primary purpose of regulation in the interest of the people.

In very few branches of governmental activity is the legal or economic line of demarcation between state and federal control less clearly drawn than that dealing with the subject of the use of water for hydro-electric development. For this reason in this field is the greatest opportunity for co-operative development of satisfactory legislative and administrative machinery for the protection of the rights of the whole people, not alone in preserving for them the natural resources still under the control of the states or of the federal government, but in encouraging development of such resources in their common interest. . . . To this end it is the desire of this commission fully to enforce and administer the terms of the federal water-power act in closest co-operation with state commissions, acting entirely free from the prejudices which have grown up around the subject of state rights as a political issue, and especially in the mutual confidence that there is to be no undue overreaching or usurpation of power.

A summary of the year's work, with mention of the chief hydro plants completed or nearly so and of important licenses issued and applications received, follows. Progress toward overtaking the accumulation of work in the accounting department is reported, and the present status of the San Joaquin River, Clarion River Power Company and New River suits, all awaiting final

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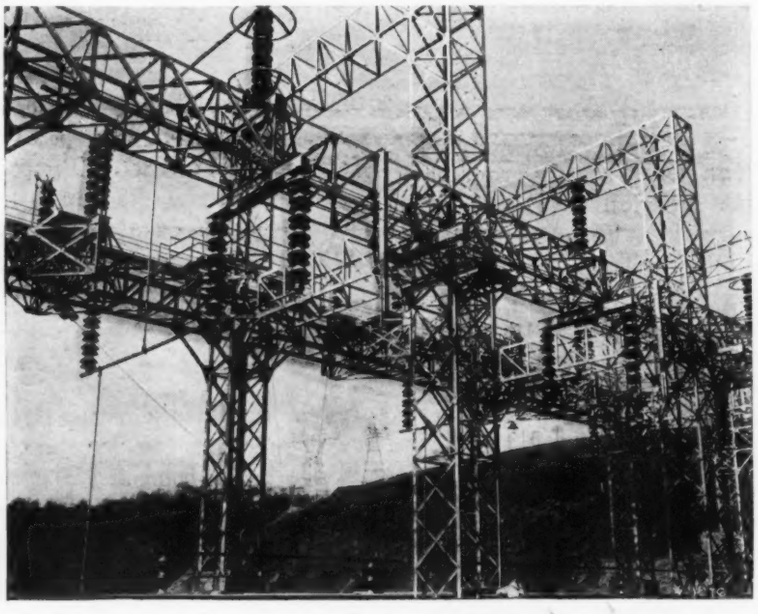
SWITCHING STATION ON TOP OF SAFE HARBOR PLANT



On Tuesday of this week the last cable span of the Pennsylvania Water & Power Company's 70-mile, 220-kv. line between Safe Harbor and Baltimore was strung. A description of this development begins on page 992.

adjudication or decision on the question of appeal, is recorded.

The 105 power plants now operating on public lands or on navigable streams and under license of the Federal Power Commission have a total installed capacity of nearly 3,000,000 hp., the report says. This represents less than 24 per cent of the total hydro-electric generating capacity of the country and only about 6 per cent of the total generating capacity of the electric public utility stations. The total cost of administering the act during the period from June 11, 1920, to June 30, 1931, was $1,976,-074.16, of which sum $744,492.82 represents direct expenditures by the commission and $1,231,581.34 estimated expenditures by co-operating services. Less than $1,000,000 was available in the "general fund" of the Treasury for offsetting these expenditures, although the gross receipts from the operation of the act have been about $550,000 more than the expenditures on account of administering the act.

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New England Power Buys Green Mountain Power

AUCTION ON MONDAY, November 30, of the controlling interest in the Green Mountain Power Corporation, serving Burlington, Montpelier, Barre and Winooski in Vermont, brought one bid of $1,025,000, for which the 28,347 no-par common shares were declared sold. The New England Power Association was the purchaser. The Green Mountain Power Corporation was previously controlled by the People's Light & Power Company of New York, a unit of the Tri-Utilities Corporation, now in receivership.

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Middle West Utilities Examination Is Begun

TESTIMONY OF STATISTICAL character was elicited on December 1 when the Federal Trade Commission's inquiry into utility matters was resumed with the Middle West Utilities system the subject of inquisition. The witnesses were William B. Horne, Harry H. Carter and Asel R. Colbert, commission examiners, who each had prepared extensive reports relating to their examination of accounts and records of the company. Functioning in 32 states, Canada and Mexico, Mr. Carter said, the Middle West is the largest of the Insull operating companies and generated 35.42 per cent of these companies' total output. The major transmission between states is across the Michigan - Wisconsin, Vermont-New Hampshire, Kentucky-Virginia, Florida-Georgia and Louisiana-Arkansas boundaries and represented 14.28 per cent of the total Middle West Utilities output.

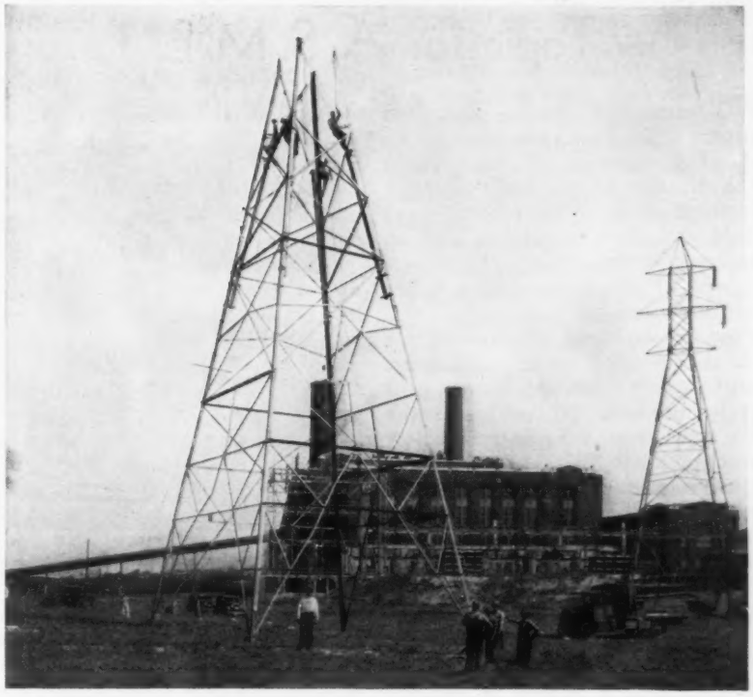
Mr. Colbert said that June 30, 1930, the Middle West Utilities system had $1,119,717,011 of securities outstanding in the hands of the public, of which $581,625,263 was in stocks and $538,-091,747 in bonds. Transmission lines of the system had increased from 8,481 miles in 1924 to 34,011 miles in 1929, population served from 1,966,035 to 6,-306,942 and gross earnings from $41,-402,607 to $162,327,274. A table showed 73,447 stockholders holding 13,071,822 shares, or an average of 178 for each stockholder.

Mr. Horne presented charts showing intercorporate relationships within the Middle West system.

Clapp Leaves N.E.L.A.

Paul S. Clapp has resigned as managing director of the National Electric Light Association to accept a position as vice-president of the Columbia Gas & Electric Corporation. No successor to Mr. Clapp has yet been selected.

CABLES REPLACE OVERHEAD LINE AT COLUMBIA STATION



Columbia power station of the Union Gas & Electric Company, Cincinnati, will be less obstructed by the complete dismantling of the towers that carried four 66-kv. lines. The four lines are now carried underground in three-conductor cables in the first installation in the country of that type of cable for 66 kv.

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Philadelphia Electric's Budget, $20,500,000

PLANS FOR EXPENDITURE of $20,519,645 in the 1932 construction program of the Philadelphia Electric Company were announced on Tuesday by William H. Taylor, president, who addressed a meeting of 2,500 employees. Mr. Taylor is among the very first executives of large light and power systems to make a forecast of this optimistic nature concerning construction outlay in 1932. He also said that studies were under way in the hope that a further voluntary reduction in electric rates could be made. Concerning construction Mr. Taylor said:

We shall have expended at the close of this year $15,667,104 upon various enlargement and extension works, with a carryover into 1932 of $5,443,000, making a grand total for the year's program of $21,110,104.

Preliminary estimates for 1932 call for an expenditure upon new construction of $18,472,645. If we add the 1931 carryover just cited and deduct the estimated carryover into 1933 of $3,396,000, we reach a total of $20,519,645 of construction which, it is contemplated, will be done in the Philadelphia Electric Company system in the year before us.

High-Pressure Steam Boilers Provide Topic for A. S. M. E.

TWO committee reports and four papers which were presented before the A.S.M.E. convention this week in New York are of particular interest to electrical men. The reports were on fuels and fuel utilization and on steam-power engineering. The papers dealt with high-pressure and other boiler installation.

Owing to decrease of demand for industrial power, the fuel utilization committee pointed out, the energy generated by utilities for the first seven months of 1931 was 5 per cent below the same periods in 1929 and 1930. The average fuel consumption per kilowatt-hour should reach a new low because of extra efforts to increase economies. Continuance is observed in the trend toward fewer and larger pieces of equipment. Where reheat is necessary compact boilers with integral reheaters are favored. The slag-tap furnace is forging ahead of dry-ash removal. A trend toward unit firing of pulverized-coal furnaces is noted.

Trends toward higher pressures and temperatures were cited by the steam-power engineering committee. One station, it said, is operating at 850 deg., and others are projected for this temperature. Two mercury-vapor installations are under construction for temperatures in excess of 900 degrees. One turbine is operating at 1,000 deg. An industrial plant is operating at 1,800 lb., and two experimental boilers of the coiled-tube type are being operated up to 3,500 lb. and 5,000 lb. respectively. However, the most popular pressure range is still from 400 lb. to 460 lb. After several years of consideration, fusion welding has been approved by the Boiler Code. A notable development has been the merging of several manufacturers to furnish steam generating units complete.

The performance of 244 boiler units operating at pressures above 200 lb. and having more than 10,000 sq.ft. of saturated heating surface was recounted in a paper by C. F. Hirshfield.

Two 1,400-lb. boilers, each capable of generating 700,000 lb. of steam per hour, have been installed at the River Rouge plant of the Ford Motor Company in the same floor space formerly occupied by two 250-lb. boilers having a capacity of 250,000 lb. of steam per hour, according to a paper by A. R. Smith and H. B. Hanson.

Results of tests with an experimental coiled-tube boiler operated at pressures of from 1,500 lb. to 5,000 lb. per square inch at a steam outlet temperature of about 800 deg. F. and a flow of approximately 4,600 lb. per hour were presented by H. J. Kerr of the Babcock & Wilcox Company. This boiler might be characterized as a straight-through flow type with relatively little water or heat storage and no recirculation, so that water has to be fed into it at the rate at which steam is demanded. The fuel feed and air have to be regulated to correspond. Quick-acting automatic feed-water pump control is essential. This unit can be started only by circulating water through the tubes, but it has been found possible to bring it up to 3,500 lb. pressure and 800 deg. outlet temperature in ten minutes, compared with from two to three hours required with the more customary high-pressure boiler.

Another experimental coiled-tube steam generator, consisting of two parallel circuits of tubing supplied with feed water at one end and delivering steam at the other at any desired pressure up to 3,500 lb. per square inch and a maximum temperature of 830 deg. F., was described by Dean A. A. Potter, Purdue University.

Discussion of high pressure was participated in by several speakers. J. E. Moultrop declared that these experiments may have far-reaching effect on power-plant practice as elimination of boiler drums offers a means of cutting costs considerably. However, he pointed out that absence of water storage places a great responsibility on the feed pumps as their momentary failure might burn the boiler tubes. Utilities are more interested in securing present efficiencies at less investment than in obtaining higher efficiencies, he remarked.

Prof. A. G. Christie warned that use of tri-sodium phosphate for water conditioning might cause trouble with turbine blading, that the power requirements of boiler-feed pumps at low load are significant, that the pulsations of triplex pumps might fatigue the metal of high-pressure units, and that use of high pressure requires more frequent reheating of steam.

Possibilities of economically storing steam at high pressures and operating boilers at more uniform loads were suggested by F. W. Gay, who said that from 10 to 20 kw.-hr. could be stored per cubic foot, and that the excavation for underground storage tanks would cost about $12.50 per cubic yard.

Election, by mail ballot, of Conrad N. Lauer, president Philadelphia Gas Works, to the presidency of the society was announced.

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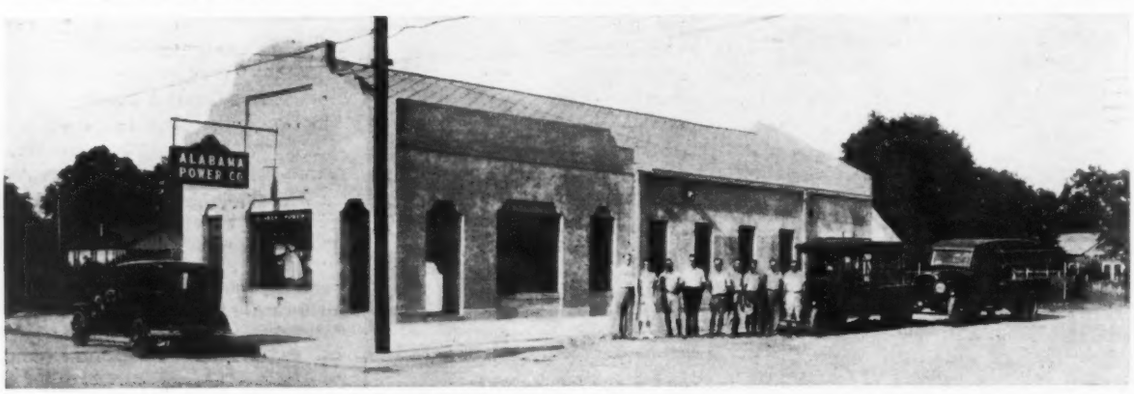
SMALL CITIES IN SOUTHERN STATE GET SPECIALLY BUILT UTILITY OFFICES



The Alabama Power Company is abandoning the practice of renting store buildings for its headquarters in the smaller towns of the state and is beginning to erect its own buildings of artistic design and suitable for office, display and storage purposes. New headquarters of this type were recently provided at Atmore, Ala., a town of 3,000 people.

N. E. L. A. Prizes for 1932 Announced by Committee

THROUGH ITS COMMITTEE on prize awards the National Electric Light Association has issued an announcement in poster form covering the prizes open for competition in the current association year. These include:

Henry L. Doherty gold medal for the most meritorious paper on any subject related to the industry.

H. M. Byllesby cash prizes of $250, $150 and $100 for best papers on increasing the usefulness of the accountant in the industry.

James E. Davidson cash prizes of $250, $150 and $100 for best papers on commercial or merchandising problems.

Martin J. Insull cash award of $250 for the most meritorious paper on public relations.

James H. McGraw cash prizes of $250, $150 and $100 for best papers on engineering or technical subjects.

There are also the gold medal given by James M. Gilchrist, vice-president Federal Electric Company, to the light and power company (member of the N.E.L.A.) making the greatest contribution to electrical advertising, and a cash prize of $1,000 to the individual responsible; the certificate known as the Augustus D. Curtis prize (donated by Kenneth Curtis, president Curtis Lighting, Inc.) to the N.E.L.A. member company making the greatest contribution to electric lighting in commercial buildings, with $500 to the person or persons responsible, and the B. C. Forbes public service cup for the company conducting the most constructive public relations campaign.

The closing date for receipt of papers or exhibits at N.E.L.A. headquarters, whence full particulars may be obtained, is April 1, 1932. Winners will be announced at the Atlantic City national convention, June 5 to 10.

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Anti-Merchandising Bill Filed in Bay State

MASSACHUSETTS WILL BECOME a field of controversy over public utility merchandising at the next legislative session if a recently filed bill to prohibit the practice arouses any interest at the committee hearing now assured. The bill was filed by Representative Garafano of Lynn and signed by representatives of local steam fitters', plumbers' and electrical workers' unions. Apparently the bill was drawn as a result of agitation against utility merchandising in other parts of the country rather than because of any outstanding territorial trade relations troubles in eastern Massachusetts. The measure provides a penalty of not less than $5,000 nor more than $10,000 per day for violation and prohibits all retail sales of gas or electrical appliances after July 1, 1932.

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ONE OF FOUR WINNERS OUT OF 380 FIRMS

The industrial relations program of the Westinghouse Electric & Manufacturing Company has received an award in an extensive contest conducted by B. C. Forbes. W. G. Marshall, in charge of employee relations, to whom $200 was presented, is seen transferring the check to E. S. McClelland, representing the Westinghouse co-operative committee for emergency relief.

▼

Municipal Competition in Starkville, Miss.

BY A TWO-TO-ONE vote and over the protest of the Mississippi Power Company, which has a 25-year franchise, citizens of Starkville, Miss., have approved plans to install a municipal light plant, and the City Council has called for bids to be opened December 11 for the installation of two Fairbanks-Morse Diesel engines. No protests have been made against the type of service rendered by the Mississippi Power Company, the Council acting only under the assumption that the city can make money out of the project.

The City Council in August entered into a contract with Fairbanks, Morse & Company to install the plant at a cost of $102,000. The power company on August 28, immediately following this step, filed an injunction suit in the United States District Court, claiming that the city did not have authority to issue an interest-bearing debt without the approval of a majority of the qualified electors. The city then, with the approval of Fairbanks-Morse, canceled the contract and submitted the proposal to the people. The election was held October 31 and went 474 to 220 for the municipal plant. The injunction proceedings were then dismissed.

During the election campaign the power company brought out that it bought the old municipal plant in 1925 at a cost of $70,000 and was granted a 25-year franchise. Rates were immediately reduced from 12 to 10 cents per kilowatt-hour and further substantial reductions have been made. The company argued that it was unfair to allow a competitor to enter so long as the franchise exists and there is no complaint against the service. It was also pointed out that the city will have to build a competing distribution system, the company now having about 15 miles of wires in the city. The power company says that it will continue in business in Starkville, regardless of any competing plant, and that statistics show that a municipal plant cannot hope to obtain more than 65 per cent of the business, which will make it unprofitable to operate.

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New Practices Mark Pennsylvania Electrification

SOME DEPARTURES from older practice have been embodied in the latest installations made by the Pennsylvania Railroad in completing the electrification of the New York-Washington section of its lines (ELECTRICAL WORLD, November 28, page 938). J. V. B. Duer, electrical engineer of the road, reports as follows:

The transmission voltage has been increased from 44,000 in the initial installations to 132,000 in our latest installation.

Substations have been changed from indoor to outdoor type, permitting considerable increase in capacity at slight increase in cost and a reduction in maintenance expenses. They have been laid out with a minimum of high-tension switching equipment, no oil switches being used on these circuits except at points where it is necessary automatically to separate the railroad into sections. All the supply and protection of the circuits is handled on the low-tension side of the transformers in the substations and on the low-tension side of the step-up transformers at the supply points.

The transformer circuit breakers, together with the bus-tie breakers, provide complete protection of the transformers against internal trouble and bus short circuits, as well as against continuous overload due to unexpected peaks, high resistance grounds or other troubles of this character.

The trolley circuit breakers feeding the trolleys from a bus are of the high-speed type, giving complete operation under short-circuit and overload conditions, including selectivity of the circuit, within one cycle.

The overhead construction, including trolley wires, auxiliary wires, catenaries, cross catenaries and transmission lines, is of non-corrosive material, such as bronze or copper, thus reducing to a minimum the amount of maintenance necessary and mak-

ing the railroad fully available for service. The clips which hold the hangers to the auxiliary and to the messenger wire and those connecting the auxiliary to the trolley wire are riveted together instead of being bolted, as heretofore, thus providing a construction which remains tight under vibratory conditions and tends toward a minimum of maintenance.

The bonding of the track rails has been thoroughly reviewed and a pin type of bond developed. This bond is similar in all respects to that used in steam territory for signal circuits and can be applied and removed by the use of a hammer without other tools. Its use has very materially reduced maintenance in electrified territory by keeping the bonding forces to a minimum.

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Record Magnification to Aid Study of Atoms

DESCRIBED AS OPENING the way to a much better understanding of virtually every material used by man, a record magnification of 250,000,000 times has been achieved by Dr. William F. Meggers of the Bureau of Standards in a special study of atoms and their actions, according to L. J. Briggs, acting director of the bureau. Dr. Meggers, who is chief of the spectroscopy section of the bureau, has been studying the complex structure of atoms for some years and spent the past summer at the Mount Wilson observatory making observations in regard to the nucleus of an atom of rhenium, the most recent addition to the family of known chemical elements.

In 1927 Dr. Meggers discovered that the complex structure of certain spectral lines was associated with the orbits of electrons. Whenever a single electron penetrated deeply into an atom the spectral lines resulting from changes in atomic energy exhibited so-called hyperfine structure.

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Insull Interests Extend Their Holdings in Ohio

APPLICATION HAS BEEN MADE by the Ohio Electric Power Company, with headquarters at Sidney in that state, a National Electric Power subsidiary, for permission to acquire the Columbus, Delaware & Marion Electric Company of Marion and two subsidiary companies at Mount Gilead — the Mount Gilead Water, Light, Heat & Power Company and the Morrow Public Service Company.

In a previous transaction the electric power and light properties formerly owned by the Ohio Edison Company and lying between Marion and Sidney were obtained through an exchange which gave Ohio Edison holdings in the northeastern part of the state adjacent to its previously owned properties in the Akron and Youngstown districts.

Nearly a year ago the Buckeye Light & Power Company and subsidiaries came under Insull control. The Buckeye company's properties are adjacent to the territory of the Ohio Electric Power Company and have for several months been operated in conjunction with the properties of the latter company. Prediction is made that all Insull electric light and power operations in central and western Ohio will eventually be in the hands of a single unit.

The transactions just noted are in line with the result of negotiations between four large holding companies controlling Ohio properties—the National Electric Power, Cities Service, American Gas & Electric and Commonwealth & Southern—which aim at redistribution of various small operating systems on logical territorial lines.

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London Power-Station Extensions Progressing

NO LESS THAN THREE large London power stations are now undergoing important extensions. At the Fulham station work in connection with the construction of the new 300,000-kw. extension to be built by the Borough Council is still in the early stages. The station, designed along American lines with four stacks, will contain five 60,000-kw. turbo-generators and sixteen boilers. At the Battersea station the two 65,000-kw. units should be generating energy in twelve months' time, and there will be room for a third set of the same size. Battersea can be extended to an ultimate capacity of 400,000 kw. Finally, there is the Barking station, which has for several years been the largest in the United Kingdom. Here twelve 20,000-kw. turbo-generators are operated. A station adjoining the present one is in course of erection and will have four 75,000-kw. sets.

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ELECTRICITY ADVERTISES A FAMOUS MOSCOW CIRCUS

—Underwood & Underwood

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Scattered Happenings in the Electrical Sphere

UNITED STATES

N. E. Power Buys Providence Plant

To co-ordinate better the use of the Manchester Street steam plant of the United Electric Railways Company at Providence with the other generating facilities of the regional system, the New England Power Association has agreed to purchase, through a realty subsidiary, the traction station for $2,150,000 and to supply energy to the railway on a 20-year contract at a rate of 1.5 cents per kilowatt-hour through its subsidiary the Rhode Island Public Service Company. The Manchester Street station has a rating of about 48,000 kw. It is already interconnected with the Narragansett Electric Company's South Street station.

New Steam Plant for Los Angeles?

Instructions to report on a plan for construction of a 60,000-kw. steam generating plant by the city of Los Angeles at Wilmington, a harbor suburb, have been issued to a committee of the city's Department of Water and Power by the Board of Water and Power Commissioners. Under the terms of an agreement between the city and the Southern California Edison Company the city can operate a steam plant after May, 1932. H. A. Van Norman, gen-

eral manager of the city department, said that engineers have been developing plans for the project for some time.

Allied Engineers, Inc., Dissolved

Recent dissolution of Allied Engineers, Inc., which was organized in May, 1930, absorbing the original firm of Stevens & Wood, has been followed by reorganization of the latter firm, with New York offices. The Allied Engineers during its existence did the major engineering and building for the electric operating subsidiaries of the Commonwealth & Southern and allied corporations.

Street-Lighting Saving in Philadelphia

A saving of more than $300,000 a year in the cost of street lighting in Philadelphia is estimated if plans just approved by the lighting committee of the City Council go into effect. They involve the replacement of 26,790 gas lamps by 12,428 electric lamps and of 5,625 gasoline lamps by 1,697 electric lamps. It is estimated the city's street-lighting bill for the new electric units will be $581,564 instead of the present $881,840.

Albany-New York Connection Pushed

Upward of 1,200 men have already been employed by the New York Power & Light Corporation, recently authorized to proceed with its 132-kv. power line from Hudson to Yonkers, part of the Albany-New York City interconnection, and with the erection of its transformer substation at Pleasant Valley, to be one of the largest in the world.

Holston River Project Comes Up

A certificate of domestication in Virginia has been granted to the Holston River Power Company, chartered in Tennessee, by the Virginia Corporation Commission. The company, which expects to do no public service business in Virginia but merely to own and hold land in Washington County, has a case pending in which it asks leave to flood certain lands in that county as the result of the construction of a dam in the Holston River in Tennessee. The Virginia commission's jurisdiction was questioned, and hence the domestication. Decision on the main question has not been announced.

Hearing on Current River Conflict

The Federal Power Commission will hold a public hearing January 5 on the conflicting applications of the Doniphan (Mo.) Hydro-Electric Company and the Current River Power Company of Kansas City for preliminary permits for power projects on Current River above Doniphan. The application of the Doniphan Hydro-Electric Company contemplates one 107-ft. dam with power plant at Gartman Rock, about a mile above the town of Doniphan. The Current River Power Company wishes to construct three dams across Current River, with power plants at Hargus Eddy, Mill Creek and Blairs Creek. The Hargus Eddy development conflicts physically with the other company's plan.

Puget Sound Company and Tacoma

The Puget Sound Power & Light Company has won its fight to defer the time when it will begin discontinuing service to private customers in Tacoma. Under the terms of an agreement reached with the City Council, the power company need not abandon the field until the end of 1932. Tacoma councilmen are also considering granting a 25-year franchise to the company to maintain power lines through Tacoma to serve outside sections, the city light department to have the right to use some of the poles to be erected by the company.

Laclede Company Fights Security Sale

An application from the Union Electric Light & Power Company of St. Louis to the Missiouri Public Service Commission for leave to acquire 3,330 voting-trust certificates of its local competitor, the Laclede Power & Light Company, is being vigorously opposed by the latter concern on the ground that it would tend toward monopoly and also force customers of the Laclede company to help pay for "dead horses like the Bagnell Dam."

Commission Lowers Richmond (Ind.) Rates

An order to the municipal electric plant at Richmond, Ind., has been issued by the Indiana Public Service Commission, on complaint of business firms, to reduce its rates $100,000 annually. The commission found the fair value of the light property to be $30,000,000. The petition was opposed by the city on the plea that it had planned extensive improvements, but the commission held that these should not be taken into consideration.

Dayton Utility's Unusual Safety Record

As of November 16, the 1,080 employees of the Dayton district, Dayton (Ohio) Power & Light Company, had worked 79,920 man-days without a lost-time accident. The entire company, averaging approximately 1,400 employees, will complete the present calendar year with a 45 per cent reduction in lost-time accidents, as compared with last year.

Bingham Station Formally Dedicated

Formal dedication of the 100,000-hp. Wyman hydro-electric power station of the Central Maine Power Company at Bingham, Me., took place November 21, with speeches from President Walter S. Wyman, Martin J. Insull and others. Two hundred were in attendance.

Rate Cuts in Washington-Idaho Area

Reductions of light and power rates in five of the larger towns in the suburban territory of the Washington Water Power Company have been announced by Frank T Post, president. These towns are Pullman, Clarkston and Colfax, Wash., and Moscow and Lewiston, Idaho. An election on the purchase by Pullman of the company's distribution system is scheduled for December 8.

CANADA

Tidal Development for Nova Scotia?

A new proposal for developing tidal power from the Chignecto Canal in Nova Scotia has been put forth by Harold S. Johnston, chief engineer of the Power Commission of that province. A modified single-basin hydro-electric development is proposed. The basin would be the tidal estuary formed by the confluence of the Maccan River and the River Hebert, southwest of Amherst. A dam across the mouth of this estuary would create a basin with an area of 8 square miles. At extreme neap tides, occurring very occasionally in the course of a year, a continuous production of 40,000 electric horsepower could, it is said, be counted upon as primary energy, supplemented by large amounts of secondary power.

ABROAD

Plan to Harness Victoria Falls

A scheme to harness Victoria Falls for the purpose of producing light and power for Livingstone has been adopted by the Legislative Council in Livingstone, Northern Rhodesia. Livingstone is 7 miles from the falls, and the chief mines in the territory are many miles north of Livingstone, but eventual industrial development on a considerable scale is foreseen.

Coming Meetings

Pacific Coast Electrical Association—Engineering Section, Los Angeles, Dec. 9-11. K. I. Dazey, 447 Sutter St., San Francisco.

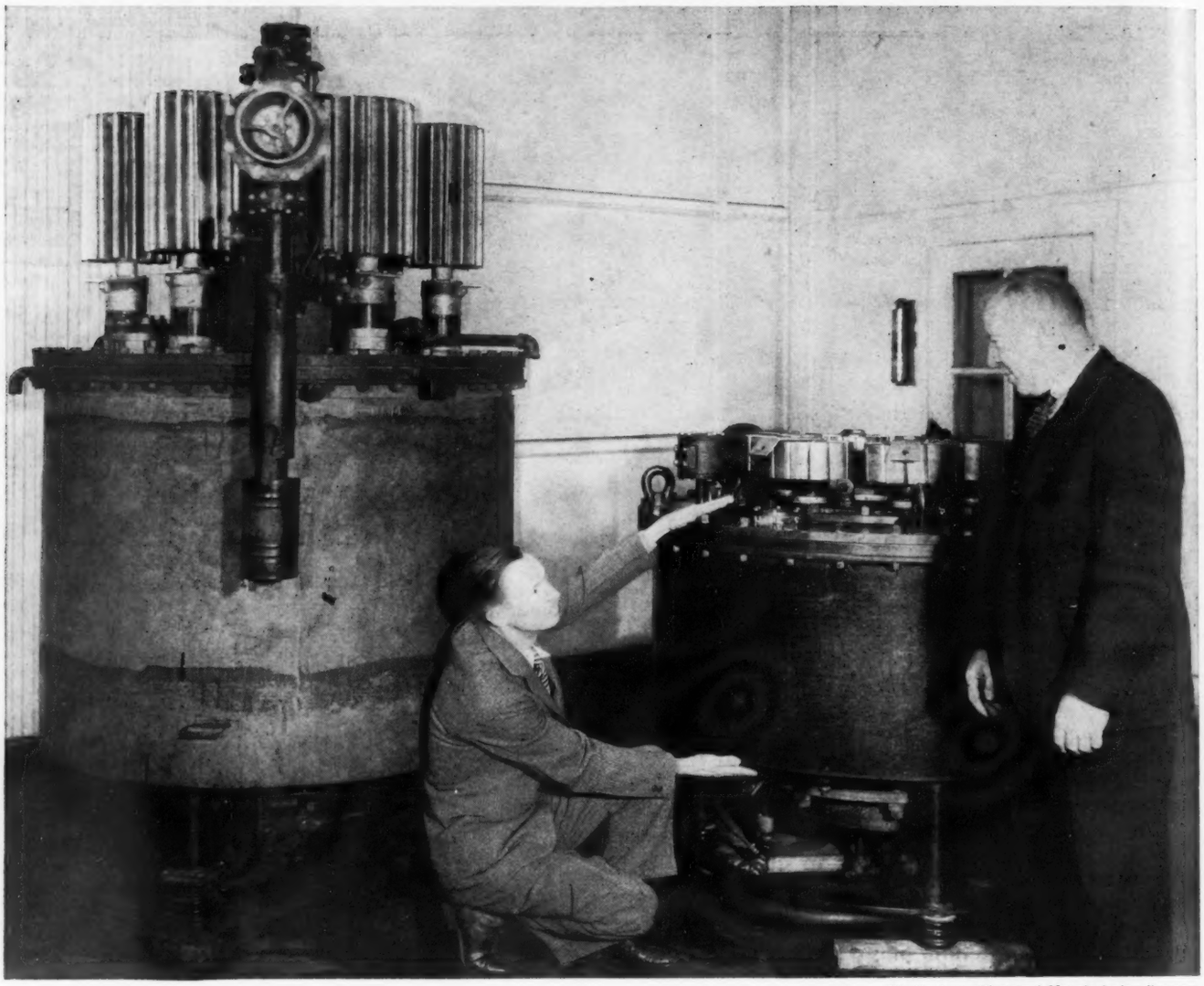
American Engineering Council—Washington, Jan. 14-16. L. W. Wallace, 744 Jackson Place, Washington, D. C.

American Institute of Electrical Engineers—Winter convention, New York, Jan. 25-29. F. R. Hutchinson, 33 West 39th St., New York.

Conference of Electrical Leagues—Philadelphia, Jan. 25-27. Society for Electrical Development, 420 Lexington Ave., New York.

North Central Electric Association—Commercial Section, Lowry Hotel, St. Paul, Jan. 29 and 30; Engineering Section, St. Paul Hotel, St. Paul, Feb. 22 and 23. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

National Electric Light Association—Group committee meetings: Engineering National Section, New York, Feb. 1-5; Accounting National Section, Statler Hotel, St. Louis, Feb. 15-17. A. J. Marshall, 420 Lexington Ave., New York.



Westinghouse Electric & Manufacturing Company

Compact rectifier for group assemblies

Greatly reduced size, increased efficiency and reliability and adaptability to grouping in compact space are some features of the "sectional rectifier" just announced. One of these units, rated at 750 kw., is shown alongside a conventional rectifier of 500 kw. rating. It is a trifle more than half the size of the lower rated unit. Because of its shape and construction, it is adaptable to group assemblies in stacked formation.

The reduction in size per kilowatt is due to the method of handling the flow of mercury vapor from cathode to condensing walls and the position of the anodes relative thereto. The anodes are grouped in the center with the cooling zone arranged around the circumference, just the reverse of the conventional unit.

Small units of this size are more easily built than large units of 3,000 kw., for example, and when operated in groups are slightly more than 1 per cent more efficient and give better performance than a single unit of the combined rating, so the manufacturer's engineers declare. Assemblies of standard size units also have the advantage of small, simple duplicate parts, they claim.

EDITORIALS

L.W.W.MORROW
Editor

Federal Power Commission reports

THE eleventh annual report of the Federal Power Commission is an interesting document. It contains facts, suggestions and philosophy of great interest to the industry.

Power projects under license now aggregate 105 with nearly 3,000,000 hp. in installed capacity. This is about 24 per cent of the total hydro capacity and about 6 per cent of the total utility generating capacity. The total cost of administering the act from June 11, 1920, to June 30, 1931, was $1,976,074.16 and the total collected by the United States under the act was $2,227,705.52. Of the total collections only $976,802.47 was available to the general fund of the treasury for offsetting the expenses. Thus expenses have exceeded receipts by about $1,000,000.

The commission outlines power development and shows trends that are encouraging. It states that power systems have become national in scope and suggests that regulation beyond that of the state is needed. In this connection it remarks insinuatingly: "Effective regulation of operating companies may be found to depend upon an extension of the commission's jurisdiction." A nation-wide study of power is suggested to gather facts, with Federal Power Commission leadership in the effort to establish costs, accounting data and statistics. Thus, through publicity and uniformity, public understanding would be had. "Co-operation under the leadership of a central agency like the Federal Power Commission promises the nearest approach to 100 per cent success," the commission says. In furtherance of this idea its recent statistical survey was instituted.

On the delicate topic of federal versus state jurisdiction over hydro resources the commission observes that the line of demarcation in control is not clearly drawn. It pleads for a broader co-operation than that embodied in the political idea of state rights and suggests legislative clarification whereby federal and state co-operation may be had.

Thus the report is replete with suggestions concerning acts and policies about which opinions differ. Some of the premises are incorrect, and we doubt whether the country will consent to enlarge the duties of the commission, at its own suggestion, in a way that ultimately would make it very largely the complete controlling governmental bureau on light and power developments.

Balance-sheet complexities condemned by bankers

LESS of platitude and more of vital, constructive suggestion appears in the recently submitted report of the public service securities committee of the Investment Bankers' Association. The committee's sane, thoughtful advice, suggestive of a more rigid analysis born of business adversity, merits the careful scrutiny of the industry and warrants action. "Clear up misunderstandings," the committee urges. Legislatures and the public, it states, resent the complexities of accounting statements and balance sheets, the use of technical terms that even the initiated can scarcely interpret and sweeping statements not backed by evidence.

Complexity of corporate structure is sharply attacked. "It is grotesquely unnecessary," the report reads, "that sometimes six, seven, even eight corporate entities should continue to exist, piled one on top of another, till responsibility is well-nigh lost in the confusion." The excuse that simplification is being undertaken is getting

stale. The bankers and their investors want, not the hope or the intention, but the accomplished fact.

The committee also urges a stabilized basis of property valuation. It urges sane, straightforward enunciation of the merits of private control. It condemns in no uncertain terms the corporate manipulation of securities for speculative purposes.

Some of the things recommended are more easily said than done. Others can be accomplished readily. It is imperative for the future wellbeing of the industry that confusion, complexity, misunderstanding be eliminated in the isolated cases where they exist. Such a program of elimination is more valuable than volumes of platitudes, irrefutable though they may be. The industry's enviable credit standing must not be jeopardized, especially by such easily reparable faults.

Farm electrification calls for co-operation by dealers

AN ANALYSIS of promotional activities and results in farm-electrification equipment sales has recently been prepared by the farm equipment committee of the Commercial National Section of the N.E.L.A. The report gives specific data regarding the status of the farm load as developed up to the present and of the promotional methods used to obtain these results. Upon the basis of experience data from 47 electric utility companies nine were selected, one from each geographical division, as representative of those most active and successful in developing this farm load.

It is interesting to note the committee's conclusions, well borne out by the nine company reports, that co-operative merchandising is especially important in building the farm load. Selling the electric way here is not merely a question of applying power in the place of hand methods, for in many instances it is a question of supplanting other forms of power such as gasoline or steam. To avoid conflicts with farm-implement dealers and manufacturers, one of the logical methods of meeting competition and producing load-building results is to make an ally of the man who is already selling equipment to the farmer, to let him handle the sale of the apparatus and get his fair profit, while the utility company assumes its share of the promotional burden.

Breakdown in dielectrics

DISCOVERY of the exact nature of the ultimate mechanism of the failure of dielectrics under stress is one of those problems of outstanding character which attract the interest of both the scientist and the engineer. From the standpoint of the former it involves the whole picture of the structure of molecules and atoms. To the engineer, on the other hand, in view of its enormous practical importance, any light which can be thrown on the nature of the failure of insulation assumes immediate significance. At the recent annual meeting of the committee on electrical insulation of the National Research Council at Harvard University new experimental results were reported which seemed to push the borderline of knowledge of this question a little further.

In the light of modern theory there are two ways in which a dielectric may fail under electric stress: First, by actual disruption or tearing apart of the positive and negative constituents of a molecule under external electric stress; second, by the breaking up of a molecule as a result of collision with a moving charged ion or particle. Values of electric stress for the former type of failure may be computed theoretically, and they lie well above the values which are observed in even the most carefully controlled experiments. Indications are, therefore, that the second is the almost universal type of breakdown.

Even in crystals there is evidence of submicroscopic internal fissures in which free ions may get up sufficient velocity to break down the crystal structure at values of field intensity well below those indicated by theory from the structure of the crystal lattice. The picture is much more obvious in liquids, in which the motion of a free ion may cause heat vaporization and ultimately the free path necessary in order that a gaseous ion may acquire sufficient velocity to generate further ions by collision. That something of this kind is occurring in the commoner complex solid insulating materials was indicated by two papers at the meeting referred to.

The first of these papers was from the Bell Telephone laboratories and described experiments on the Schrott effect in insulators, which involves the irregularities in the conduction current and extends the idea that small conducting canals are created during the first stages of breakdown. The second paper was from the laboratories of the Detroit Edison Company and described the application to cable insulation of the recently announced discovery of the presence of X-radiation from semi-conducting materials when under potential stress. The X-rays arise presumably in the collisions in the motion of ions in the minute channels referred to. It is obvious that the picture presented in results of this character is quite consistent with the well-known influences of temperature and pressure on breakdown in gases, liquids and solids. The extension of these new methods of study is certain to lead to new knowledge.

Rating local managers

EXCESSIVE centralization of authority at holding-company headquarters has in some cases impaired local initiative and diminished the respect of the local public for the resident head of the company. The contrast between the authority possessed and exercised in the days of individual operation and the closely regulated functions of the new régime is often too noticeable. There has been a tendency in some instances to establish a kind of civil service rating of local managerial posts. This has made trouble in morale when too rigidly followed without regard to the record of the individual and check-ups of his standing in his territory as influenced by many intangible services. Again, the community acquaintance enjoyed by the local executive and his staff through all the ramifications of friendship and social contacts has sometimes been overlooked. More careful study of the fitness of men to continue to serve indefinitely in familiar territory will reduce the number of readjustments necessary in the local organization and help build favorable public opinion for the distant controlling enterprise.

Where the local manager is given all the authority he is capable of assuming minimum trouble will arise from rate problems, questions of service and public relations. A voice in the selection and retention of department heads, power to make local purchases within established limits, compensation proportioned to the full value of services rendered, selection of personnel from local sources where practicable and a share in directing counsels all bear upon subsidiary morale in leadership. After all, the qualified resident executive is the key man in successful operation and development of subsidiary companies.

Ranges to follow trail broken by refrigerators

ELECTRIC ranges are to have their day of real, "honest-to-heaven" commercial exploitation on a national scale. This seems assured as efforts of manufacturers and utilities through their respective associations shape themselves toward definite action. The recent approval of the project by the range committee, Commercial National Section, N.E.L.A., places it on a footing of acceptance in principle, and all that apparently remains now is to work out the details of the campaign and get it started. The electric range is at last to be treated on the comprehensive commercial scale that should have been employed a long time ago in dealing with it.

The success of the refrigerator campaign has convinced many who before were doubters that the sale of a meritorious article can be tremendously increased by intelligent and extensive advertising and planned sales activity. There is a "but," however. It lies in the fact that the range disputes its field against much more effective competition than does the electric refrigerator and also that its competitors are much more largely controlled by the same individuals or companies who operate the electric utilities than is the ice industry. Moreover, a great many more central stations throughout the country should have rates that will permit the operation of electric ranges.

Obstacles to the widespread sale and use of electric ranges are minor ones, however. There is an existing market in which both rate conditions and competitive conditions are conducive to their sale on a very large scale. A well-organized national effort with a distribution organization adequate to "follow through" the advertising program will get results.

Safe Harbor Development Adopts K

All initial units have automatic governor adjustment of blades.

River presents wide spread between maximum and minimum flows.

Two 220-kv. lines found as economical as six of 110 kv.

Co-ordinated insulation principle employed in conjunction with elevated ground wires.

WHEN the Safe Harbor plant on the Susquehanna River is in operation nearly all of the 225-ft. fall of that river from Columbia, Pa., to its mouth will have been applied to power production. The present Holtwood plant of the Pennsylvania Water & Power Company, parent of the Safe Harbor Water Power Corporation, and the Conowingo plant of the Susquehanna Power Company are using nearly all of the fall below Safe Harbor. The head at Safe Harbor is initially 53ft., with 2 ft. more to be obtained later. The distinctive feature of the plant is the use of Kaplan type wheels.

Four types of runners were considered by the designers of the station. These comprised the fixed-blade type, the hand-adjustment type (requiring a shutdown to change the blade pitch), hand adjustment while in operation, and, finally, completely automatic governor control of the blade pitch. The second scheme has little to commend it for the existing head and flow circumstances. Also, there was found to be little difference in price for the third and fourth possibilities. The choice, therefore, narrowed to a consideration of the fixed blade alone or in combination with automatic blade adjustment. The determination naturally hinged upon evaluating the advantages of automatic adjustment against the prospective increase of 15 to 20 per cent in installed cost of turbines and governors over that for fixed-blade wheels.

The particular location of the plant with respect to important load centers, not ignoring the likelihood of some railway electrification load in the immediate vicinity of the project, pointed to the desirability of providing for sectional operation of the plant. The bus layout will be adapted to such handling of the station capacity, and the final decision to install all six initial units of the Kaplan automatic blade adjustment type was founded primarily on this projected characteristic of operation. The Francis type turbine was set aside because of its slower speed, larger space requirements, lower part gate efficiency and larger loss of capacity under flood conditions. Also, making all six of the same type provided maximum interchangeability and minimum carriage of spare parts.

It was concluded that the difference in cost between

Power house and dam make a mile of structure

Section at extreme left is non-overflow. Left of the island is a 24-stoney gate spillway. Island section is non-overflow. Right of island are four stoney gates and four double-leaf gates for regulating purposes. The power house has forebay cleared of ice and trash by dike and skimmer wall.

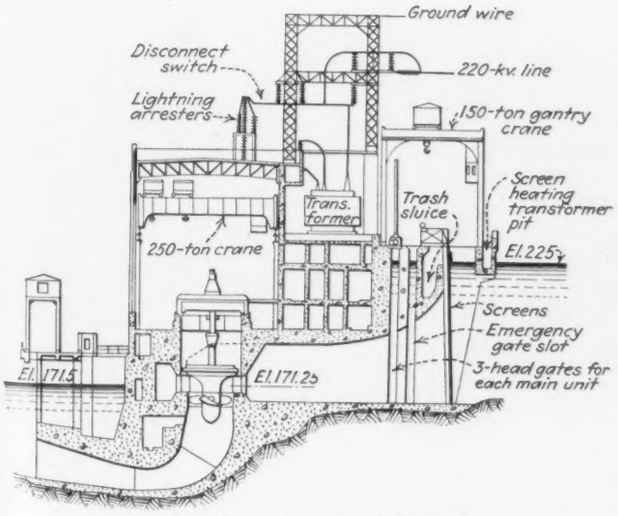
Courtesy Fairchild Aerial Surveys, Inc.

Kaplan Turbines

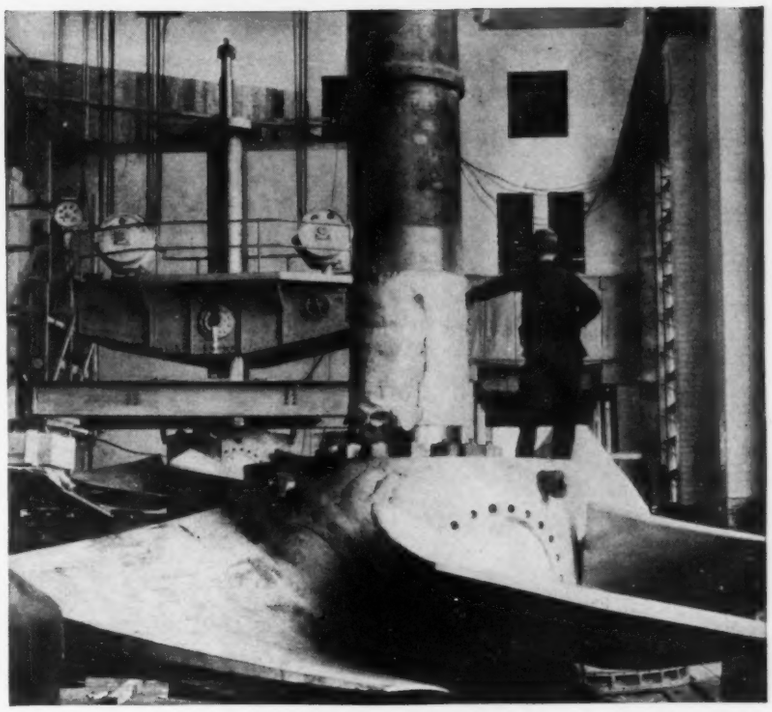
fixed-blade and automatic-blade adjustment would be offset by the capitalized value of the following attributes of the adjustable-blade machine: First, the ultimate capacity is determined by high stream flow under reduced head conditions. This item would amount to several thousand horsepower for a plant contending with the flow characteristics of the Susquehanna. Second, a larger output is obtained by the Kaplan runner from a given amount of building space, and the structural cost is by no means an insignificant element of the total cost of the development. Third, the Kaplan wheel under automatic adjustment has the advantage as to flexibility and higher sustained efficiencies.

A combination of two Kaplan and four fixed-blade turbines would practically eliminate the loss of output in low flow due to operating fixed-blade machines at inefficient loads if the units were all operated in parallel —a condition that may not exist. The combination scheme, however, sacrifices a proportionate part of the other advantages cited for Kaplan turbines and also sacrifices the advantage of complete uniformity of design and interchangeability. For the large-sized wheels under consideration the saving in cost of the combination scheme was not sufficient to offset the disadvantages.

Four Kaplan wheels are therefore being installed now and the next two of the initial six will follow in the next two years. S. Morgan Smith Company and I. P. Morris & De La Vergne, Inc., are each providing three units, each of which is 220 in. in diameter and rated at 42,500 hp., with a speed of 109.1 r.p.m. Woodward governors will be used.



Section through one of the units



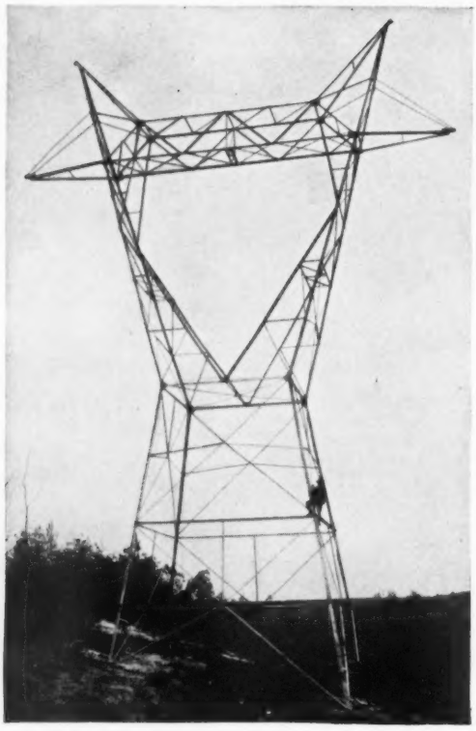
Kaplan blades controlled through hollow shaft

Angle of turbine blades visible in foreground controlled by operating shaft as seen projecting from the top of the main turbine shaft of the runner in the background.

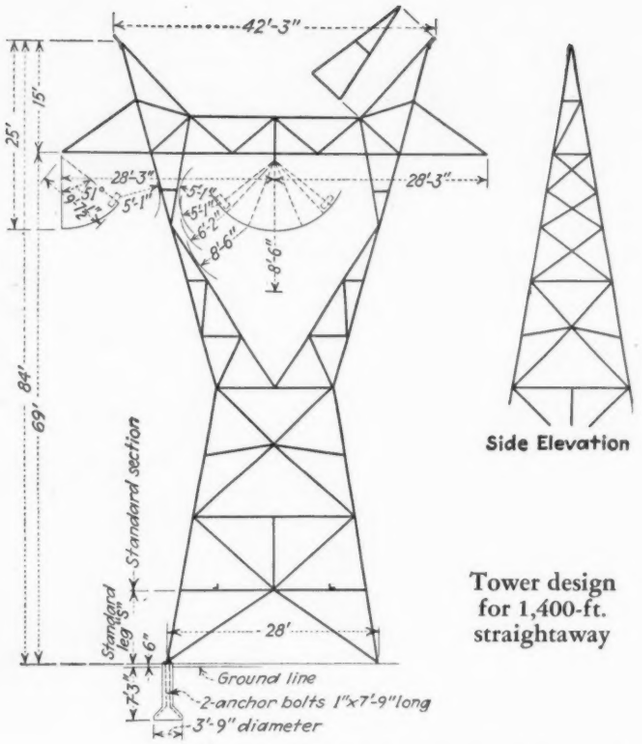
The pond created by the Holtwood dam reaches 8 miles up stream to the site of the Safe Harbor plant. The Safe Harbor dam creates a 10-mile reservoir approximately one mile wide and establishing a usable storage of more than 3,000,000,000 cu.ft. from the river's assembly of water out of its drainage area of 26,090 square miles. Stream flow ranges from a minimum recorded seven-day average of 2,300 sec.-ft. to the peak 1889 flood of 725,000. The average flow is 39,000 sec.-ft., with a median value of 23,100. Full flow power house discharge from the six units will amount to 48,000 sec.-ft., representing a value of 1.84 sec.-ft. per square mile of drainage area. The rated capacity of the initial installation of six units will be 255,000 hp., considerably in excess of the figure estimated during the early stages of the investigation of the project. Corresponding advances in the art of hydraulic turbine design may make the ultimate total capacity for the final array of twelve units very materially greater than what was originally considered obtainable from the stated values of flow and discharge.

In the middle of the river is an island and the middle portion of the dam is established on it. This and the portions abutting the two shores are non-overflow sections, constituting a total length of 2,270 ft. The two spillways provide a crest length of 1,810 ft., divided between two sections at either end of the island bulkhead. The power house, 920 ft. in length, abuts the eastern bank. Up stream, projecting from the east bank, is a rock-filled dike which is connected to the western end of the power house by an ice skimmer wall 1,495 ft. in length.

Twenty-four gates of the stoney type, giving a clear span of 48 ft. with a present water depth over the sill



Standard tower readily adapted to sloping terrain



Tower design for 1,400-ft. straightaway

Also adapted to 1,000-ft. span with 3-deg. angle on line. Clearances indicated are for swing angles of 22, 42 and 51 deg.

of 30 ft., later to be increased to 32 ft., are provided in the west spillway section. The eastern spillway affords four stoney gates and four double-leaf regulating gates. The discharge capacity of the two spillways with pond at initial normal elevation is 970,000 sec.-ft., a figure 34 per cent in excess of the maximum recorded flood flow.

Two 220-kv. lines cost same as six 110-kv.

The greater part of the output at the beginning of operations will be delivered to Baltimore. The Pennsylvania Water & Power Company and Consolidated Gas, Electric Light & Power Company of Baltimore have contracted for the entire initial generation. This delivery of the output of 255,000 hp. would have called for six 110-kv. lines, of which four would have taken one route and two another route into the Baltimore load center. Actually it was found that the cost would have been about the same as for two 220-kv. lines on separate rights-of-way and the latter is therefore the adopted plan. This choice of voltage of course facilitates a connection without transformation to the existing 220-kv. systems in Pennsylvania and New Jersey whenever that becomes feasible and desirable.

One circuit approximately 70 miles long will swing to the westward of Baltimore and enter it from the south; the other, 50 miles long, projected for 1933, will terminate at Riverside, southeast of the city, where there is a site for a projected steam station. Cables of 33 kv. will connect the line with the load center pending the establishment of the steam station. The initial line, lying to the west, is also to be tied into the 66-kv. ring bus encircling the city.

The line now being built is designed with the aim of attaining 100 per cent reliability of performance. Two ground wires, 203,200 circ.mil A.C.S.R., elevated 25 ft. above the level of the conductors (795,000 circ.mil A.C.S.R.) and spread horizontally 42 ft. 3 in., bring the outside conductors within the cone of their protection. The principle of insulation co-ordination has been followed to the extent of specifying non-resonating transformers with insulation and impulse performance exceeding that of fourteen 10-in. insulator disks and by the use of a protective spill gap and lightning arrester. A 66-kv. connection is being made to the existing Holtwood-Lancaster double-circuit steel-tower line now feeding utility customers in Pennsylvania from the Baltimore system.

There will be twenty 10-in. insulator units in a string, each unit having a length of $5\frac{1}{4}$ in. The total distance from crossarm to conductor will be approximately 10 ft.

Three intakes for each wheel

Each of the waterwheels has three intakes. The middle intake has a gate with fixed rollers and a screw hoist. The two others have plain slides and will be lifted by one of the two 150-ton gantry cranes provided on the gate gallery. The horizontal center line of the runner blades will be 6 ft. below normal tailwater level. The excavation and intakes have been completed for the ultimate installation of twelve main units. In addition to the main Kaplan units are two house units of the Francis type, each rated at 2,100 hp. and running at 180 r.p.m.

Two General Electric and two Westinghouse 60-cycle generators are being installed this winter in positions Nos. 3, 4, 5 and 6. They are 13.8-kv. units with a normal rating of 28,000 kw., at 90 per cent power factor, but with field and excitation capacity adequate for 31,111 kva. at 80 per cent power factor, both ratings at 60 deg.

C. rise. The main and pilot exciters will be direct connected and all will be of overhung rotor design. The mechanical design contemplates a rating of 36,000 kw. at 100 per cent power factor and the maximum electrical rating assigned is 36,000 kva. at 80 per cent power factor and 80 deg. C. rise. All generators will have closed system of ventilation. The fifth 60-cycle generator will probably be installed in the No. 7 position in 1933.

House service will be at 480 volts from two units rated 2,500 kva. at 70 per cent power factor. These units will have open ventilation.

First waterwheel single-phase generator

Another generator, originally planned to be 60 cycles, will be changed to a 25-cycle machine designed and built for single-phase operation with a single-phase rating of 28,000 kw. at 80 per cent power factor and will be installed early in 1933 in position No. 2. So far as can be learned this will be the first waterwheel generator built in this country with spring-mounted stator and the first large vertical waterwheel generator operated single phase in this country. The power house has been completed for seven units, the No. 1 position being reserved for a second 25-cycle, single-phase unit, the speed ring for which is already in place.

An outdoor type 60/25-cycle frequency changer will be installed early in 1933 with a single-phase rating of 25,000 kw. at 80 per cent power factor. From the 25-cycle bus underground cables will run down the east river bank to a step-up transformer station at the mouth of Conestoga Creek, where the single-phase power for railroad supply will be stepped up to 132 kv. From this transformer station a four-circuit, steel-tower, 132-kv., single-phase transmission line will be built to Perryville, Md., where power will be sold by the Consolidated Gas, Electric Light & Power Company of Baltimore to the Pennsylvania Railroad for the electrification of the Philadelphia, Baltimore & Washington line from the Susquehanna River to Washington. There will be a second point of supply at a frequency-changer substation to be erected by the Consolidated company south of Baltimore.

Initial installation of transformers will consist of two banks of three single-phase units, 13.8 kv. delta to 230 kv. wye, each bank having a rating of 84,000 kva. at 230 kv. wye with self-cooling and a 50 per cent increase under forced air cooling. One single-phase spare unit will be provided. The first four single-phase units are being supplied by the General Electric Company. The second bank will not be installed until the second line to Baltimore is built, probably in 1933. There will also be two three-phase transformers for the 66-kv. output, each rated 30,000 kva. self-cooled and 45,000 kva. under forced air cooling with 55 deg. C. rise. They will be equipped for 10 per cent buck or boost tap changing under load and are being supplied by Westinghouse.

A double bus scheme is incorporated for the low-tension bus with selector oil circuit breakers for each piece of equipment. Bus tie and bus section oil circuit breakers are installed in the initial layout and provision has been made for the future use of bus reactors as the station is expanded. All oil circuit breakers are Westinghouse Deïon grid with ratings of 2,000, 3,000 and 4,000 amp. at 15 kv., affording an interrupting capacity of 1,500,000 kva.

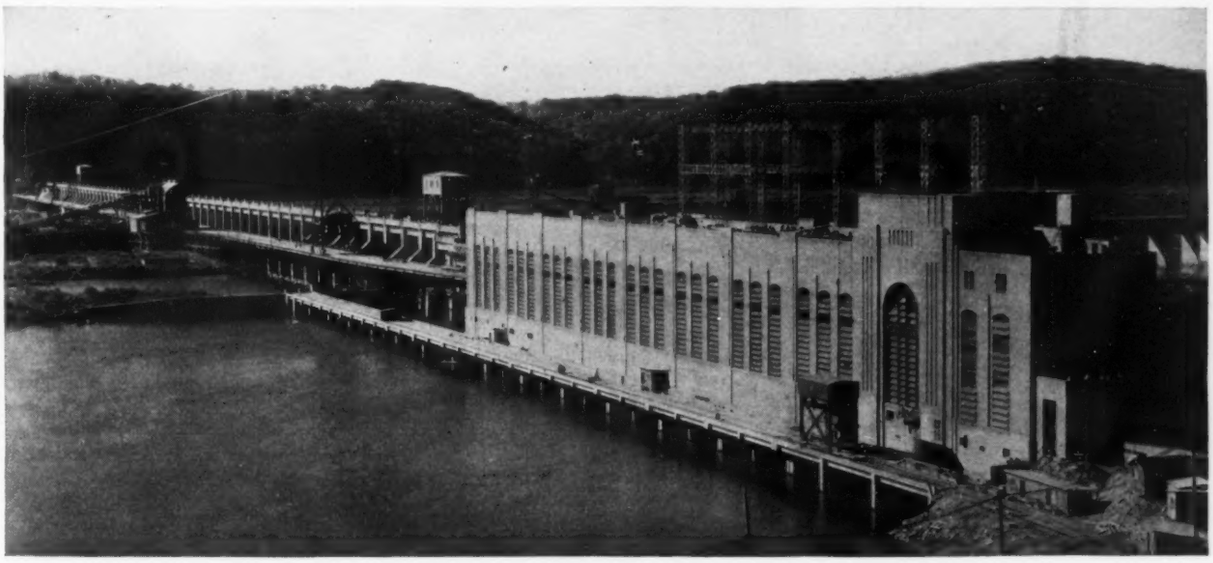
The 480-volt auxiliary supply is served from a double bus with bus sectionalizing and bus tie oil circuit breakers. There are duplicate feeders to safety switch groups located at appropriate points throughout the station.

Incidental to the construction operations, all possible use was made of electrically driven construction machinery. A 4-cu.yd. shovel, stiff-leg derrick hoists and a central air-compressor plant capable of delivering 4,500 cu.ft. of air per minute at 100 lb. pressure contributed major portions of the electrical construction load. The supply was obtained by building 8 miles of 33-kv. line from Holtwood to meet the estimated requirements of 3,750 kva. delivered at 2,300 volts around the project.

Preliminary costs kept at low figure

Some conception of the magnitude of the project can be obtained from the fact that the job calls for the excavation of 1,800,000 cu.yd. of rock and earth and the use of 490,000 cu.yd. of concrete. This, with the delivery of cement and other construction materials, repre-

Power house practically finished



sents 15,000 freight-car loads. In addition the crushed stone from the local quarry involved 12,000 carloads. Twenty miles of construction trackage had to be built.

The Safe Harbor and Holtwood plants will in effect be operated as a single development and together constitute the largest project in the East south of the Niagara and Canadian hydro developments. All the preliminary engineering, test surveys and borings were made by the staff of the Pennsylvania Water & Power Company without the expense of outside engineering or promotional service. The preliminary costs (exclusive of property) reflected on the books of the Safe Harbor Water Power Corporation, as a consequence, represent less than 1 per cent of the estimated total cost of the initial installation and an even lesser fraction of the ultimate cost of the completed station.

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Big-Brother to the Pole-Hole Digger

Transmission line construction men would have found something strangely familiar if they had visited Delray power house No. 3 of the Detroit Edison Company while the caissons were being sunk for the addition. Here they would have seen the pole-hole digger, grown considerably larger and boring a deeper hole. The earth drill in use at Delray differs from the common, smaller varieties of earth-boring machines in that it does not lift the dirt out of the hole. Instead, the drill, continuously flushed with water, goes right on down to hard pan and then is raised, leaving the hole filled with semi-liquid mud. After the caisson cylinders have been sunk the hole is dug out with a clamshell.

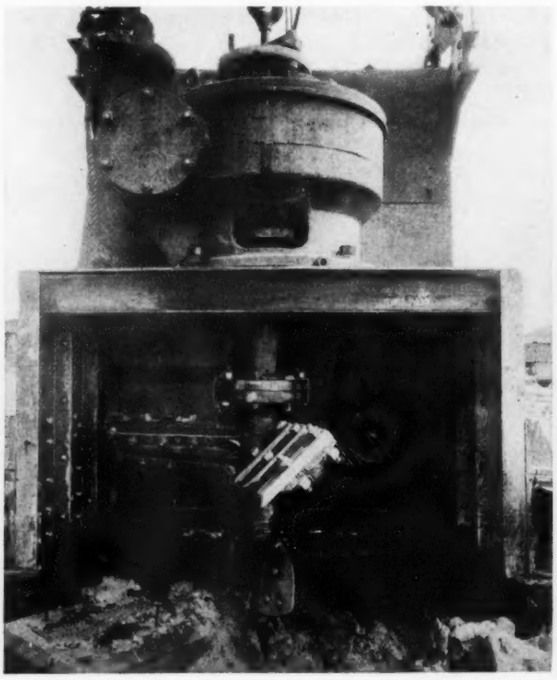
Results of Failure to Test Grounds

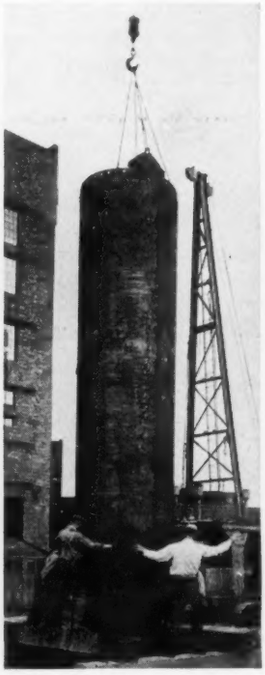
Commenting on the editorial "Failure to Test Grounds Inconsistent with Investment,"* a reader says it is fine as far as it goes. But he continues: "When an arrester is connected to a ground which is of too high resistance to permit it to function properly the loss in arrester investment is probably the least important item of waste involved. There is the loss due to burn-outs and blown fuses and the not so obvious, but none the less real, loss resulting from the loss in confidence on the part of the customer and the general dissatisfaction engendered by repeated interruptions to the service. Then there may be some actual loss of revenue and some actual financial loss to the customer due to absence of the service.

"A high resistance arrester ground is always a potential shock hazard.

"Artificial grounds (where better electrodes are not available) are required by both the underwriters and the utility, as a general thing, for grounding the customer's installation at the main switch. The customer is required to pay for this ground and he is told that it must not exceed 25 ohms and that it is necessary for his protection. He is then required to pay an inspector, selected by the utility, to examine his wiring and issue a certificate therefore before the installation can be connected to the utility system. And then no one takes the trouble to determine whether or not the supposed ground is, in fact, a ground at all (within the limits specified by the requirements). Is this consistent with anything or is it fair to the customer? We know of only one utility, and no underwriters' department, which is actually measuring the resistance of these grounds. No doubt there are others, but we have not run into them as yet."

**September 26, 1931, issue of* ELECTRICAL WORLD.





Uniform Accounting Helps Stabilize Industry

The plan for the stabilization of industry presented by Gerard Swope, president of the General Electric Company, provides that each industry shall be required to adopt standard accounting and cost systems. The electrical manufacturing industry, by co-operative endeavor, has been aiming for this objective for many years.

THE electrical manufacturing industry has been actively engaged since 1916 in an organized way in a movement to secure the advantages attending the use of uniform accounting procedure by its member companies.

At the time the industry undertook this movement the Federal Trade Commission, under the leadership of Edward N. Hurley, its first chairman and himself an electrical manufacturer, was calling attention to the lack of knowledge of cost accounting. The report of the commission for 1916 says: "Only 10 per cent of our manufacturers and merchants know the actual cost to manufacture and sell their products. Forty per cent estimate what these costs are and 50 per cent have no method, but price their goods arbitrarily."

President Wilson commended Mr. Hurley for his activities in this direction, saying in a letter to him on May 12, 1916:

> I wish to commend your efforts generally and in particular your endeavor to assist the small manufacturer and merchant to better his condition by helping him to improve his cost accounting and bookkeeping methods. . . .
>
> Your suggestion that trade associations . . . should be encouraged in every feasible way by the government seems to me a very wise one. . . . These associations, when organized for the purpose of improving conditions in their particular industry, such as unifying cost accounting and bookkeeping methods, standardizing products and processes of manufacture, should meet with the approval of every man interested in the business progress of the country.

Now at a time when it is suggested that federal supervision of trade associations be extended and that the use of uniform accounting procedure be made compulsory, it is interesting to recall the willing and intelligent co-operation which the electrical manufacturing industry gave to the Federal Trade Commission through its sponsorship of a voluntary movement to achieve the same ends.

Started by a committee

This movement was initiated by the appointment of a representative volunteer committee composed of executives and accounting officers of ten companies. The members of this committee worked incessantly and without thought of personal reward or of advantage to their own companies in the preparation of an accounting manual, which was made available to the industry in April, 1917. By October, 1919, the third edition of this manual had appeared. The fourth edition came out in October, 1922, and the fifth in September, 1926. The most recent, or sixth, edition was published in August, 1931.

The chairman of the original committee was C. E. Patterson, comptroller of the General Electric Company. Of the original committee two members still remain, namely, J. C. Belden of the Belden Manufacturing Company and H. F. Vogt, Cutler-Hammer Company.

The early editions of the manual were devoted largely to a classification and definition of accounts and to a specification of the items to be included in costs. A classification of accounts, as conceived by this committee, is composed of all accounts that are essential to the proper and uniform recording of financial transactions and operating results. Although there was little discussion in the early editions of the manual of accounting procedure and particularly of the technique of cost accounting, a beginning was made in this direction. A chapter entitled "A Suggested Method for Applying the Standard Accounting and Cost System" related to accounting procedure. In this chapter free use was made of the practices recommended by the Federal Trade Commission as set forth in its publication entitled "Fundamentals of a Cost System for Manufacturers."

The views of the committee on accounting procedure were set forth in greater detail in the fifth edition of the manual, published, as stated, in 1926. This edition, for example, contained a detailed description of procedure for the obtaining of the costs of distribution by lines of product. This is a branch of accounting on which even today in most industries there is a great lack of standardization.

The accounting manual is confined to those broad principles of sound accounting that are adaptable with equal facility by large and by small manufacturers in every branch of the industry. The products of the industry are diverse and entail widely differing methods of manufacture and of distribution. The committee recognized this condition and emphasized in the early editions of the manual the necessity for the development of supplementary procedure which would take into account the peculiar needs of individual branches of the industry.

During the past two years the uniform accounting movement has been carried on at an accelerated rate. During these two years several of the individual branches of the industry, as represented by sections in the National Electrical Manufacturers' Association, have interested themselves in the development of the supplementary procedure above referred to, and the accountants of those sections have been actively engaged in the study of common accounting problems. Thus, the plans of the committee in this direction are being put into practical effect.

The committee likewise has been active in continuing its study of the broad accounting problems of the industry. The sixth edition of the manual embodies the results of this study. This edition, although little changed in the fundamentals previously prescribed, contains considerable additional material. For the first time sample forms of financial statements, reproduced from typewritten examples, are shown. They are intended to convey to the executives of the industry forms of effective presentation of financial facts and operating results, and to the accountants they are suggestive of proper arrangement of these facts.

More of the manual is devoted to accounting procedure than in previous editions in recognition of developments in practice that the committee now accepts as sound and suitable for use throughout the industry. There is, for example, an explicit outline of procedure through the use of "standard costs," a subject which is of especial interest to cost accountants at the present time. There is more material on the treatment of manufacturing overhead. There is a comprehensive explanation of the accounting treatment of expenditures for manufacturing plant. Careful attention is given to the principles underlying depreciation.

The uniform accounting movement thus will be seen to be an active one in this important branch of the electrical industry which is composed, according to the most recent Census of Manufactures, of 1,798 plants with 329,000 wage earners. The commodities produced are valued at $2,300,000,000.

Although the movement is carried on under the auspices of the National Electrical Manufacturers' Association, the advantages accruing therefrom are not confined to its members. The association recognizes that in a broad movement of this kind it is of advantage to enlist the co-operation of all manufacturers and to make available the benefits of the co-operative activity. Fortunately, uniform accounting, which concerns itself with one of the fundamentals of business operation, is an association activity which may be participated in with profit by every company.

The benefits which accrue to the individual company through a better financial control and a more exact knowledge of costs are certain to be reflected in more intelligent stabilization of the industry. Thus, the uniform accounting movement contributes its part to industrial progress.

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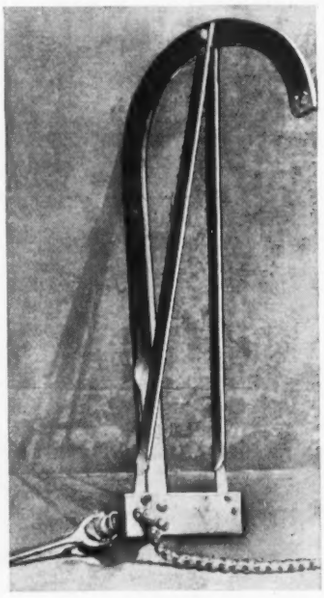

Pole-Top Crane

For raising small distribution type transformers in pole installations this device has been found to be an effective time saver in the overhead construction department of the Louisville Gas & Electric Company, Louisville, Ky. It is fixed to the top of the pole and is held firmly in place by the pipe wrench chain arrangement, shown in the illustration, which is tightened up by means of the threaded stud at the fixed end of the chain.

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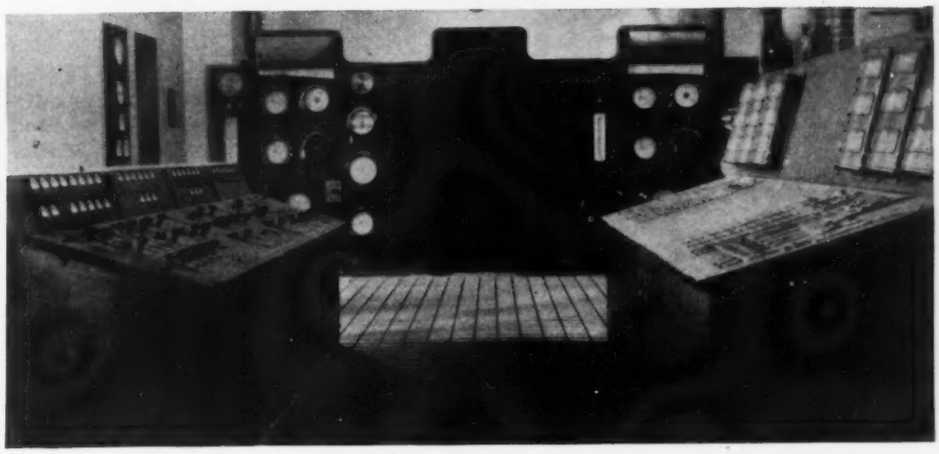
Recommendations Made for Sports Illumination*

Sport	Number of Source Locations	Height of Mounting	Kw.	Approximate Foot-Candle Intensities	Approximate Installed Cost
Baseball, class AA, A	8	70–80	300–400	20–25	$12,000–$20,000
Baseball, class A, B, C, D	8	70–80	225–300	15–20	10,000– 15,000
Baseball, industrial and high school	8	60–80	150–225	10–15	7,000– 10,000
Playground baseball	6	35–45	12–20	4–8	800– 1,500
Football, large municipal, large college	6	80–90	300–400	30–40	15,000– 20,000
Football, municipal college	6	70–90	150–300	15–30	8,000– 15,000
Football, high school, minimum	8	50–70	50–150	5–15	2,500– 8,000
Racetrack, half mile	50	35–45	100–150	5– 8	8,000– 12,000
Polo	16–20	60–75	200–400	4–10	8,000– 20,000
Lacrosse	6	70–90	150–400	15–40	8,000– 20,000
Golf, pitch and putt, short course	10–20	50–60	60–150	5–10	3,000– 8,000
Golf, miniature	6–8	35–45	12–24	5–10	1,200– 2,000
Tennis, fast play, one court	6	35	15–45	10–30	1,000– 2,500
Tennis, fast play, multiple courts	6	35–45	15–45*	10–30	500– 1,200*
Tennis, playground, one court	4	35	8–15	6–10	700– 1,500*
Tennis, playground, multiple courts	4	35–45	8–15*	6–10	300– 600
Swimming pool	4–8	25–45	12–24	4–12	500– 1,000

*Values per court.

*From "Open Floodlights and the Lighting of Outdoor Sports," by R. J. Swackhamer of the General Electric Company, a paper presented at the preconvention session of the Illuminating Engineering Society's recent Pittsburgh convention.

Centralized Control Boards for a 30,000-Kw. Station

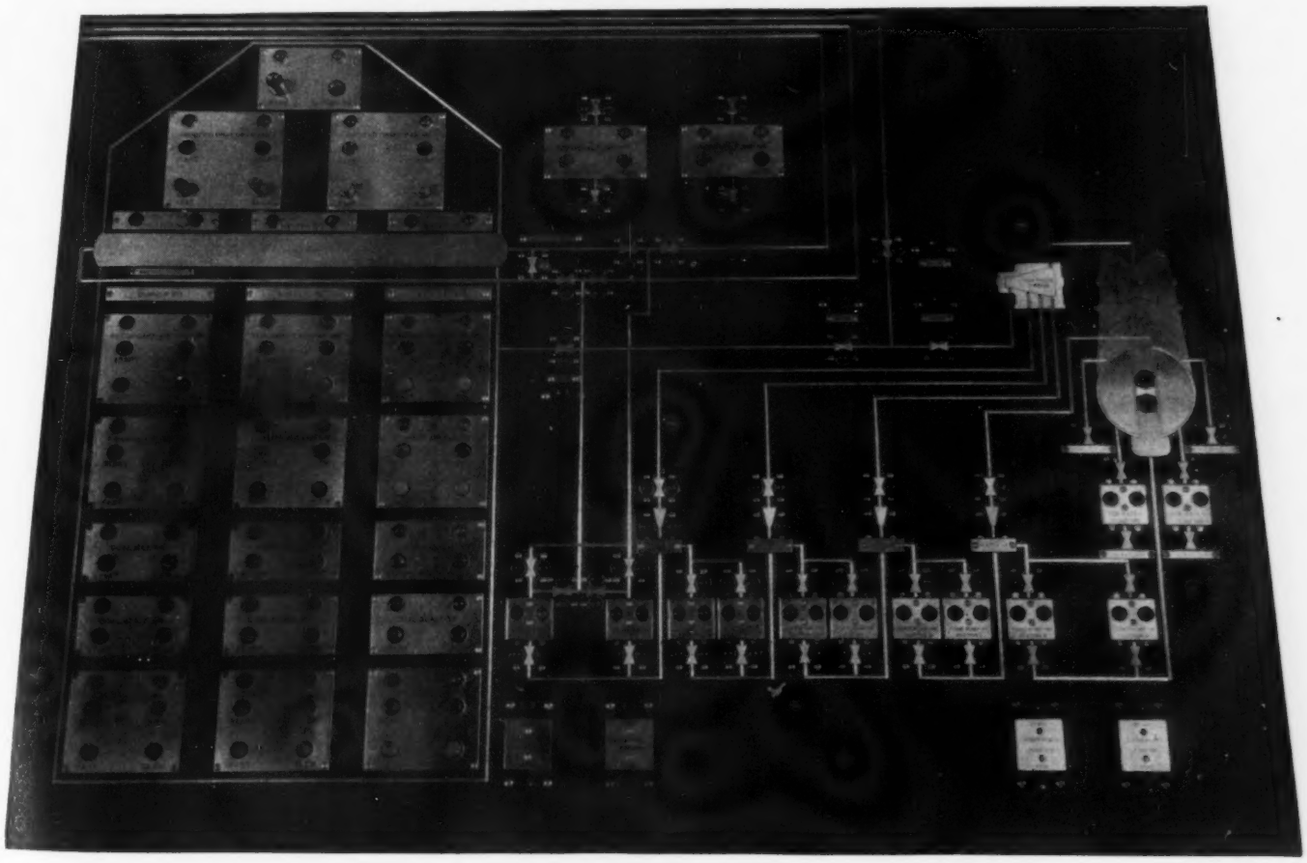


At the recently completed Bremo station of the Virginia Public Service Company an unusually interesting arrangement of control and indicating equipment has been made. From the boards shown in the accompanying illustrations control of the entire plant, including boiler and turbine rooms and switching operations, is effected. The low-level, slanting, grouped instrument panels add to the attractive appearance and ease of operation in this plant. One operator can readily handle all normal station operations.

All coal and air going to the pulverized-fuel mills and burners is measured accurately with indications thereof on panels in this room. Co-ordinated values established for various loads permit ready manual adjustment of fan and mill feeder speeds as well as of diphenyl-oxide pumps. A miniature panel layout of the entire piping system shows the operation of equipment and the open or closed position of valves at all times.

Electrical benchboard design was largely simplified by the use of miniature-type instruments on the main control board. There is no low-tension switching involved in the operation of this plant. High-tension switching is accomplished in the outdoor switchyard.

In order to make the operation of this plant as nearly foolproof as possible the control knobs for unrelated functions have been made of dissimilar shapes to aid operators. Thus the subconscious is called upon to work with the conscious in insuring safety.



Concentrated High-Speed Industrial Control

By LOUIS F. LEUREY
Consulting Electrical Engineer, San Francisco, Calif.

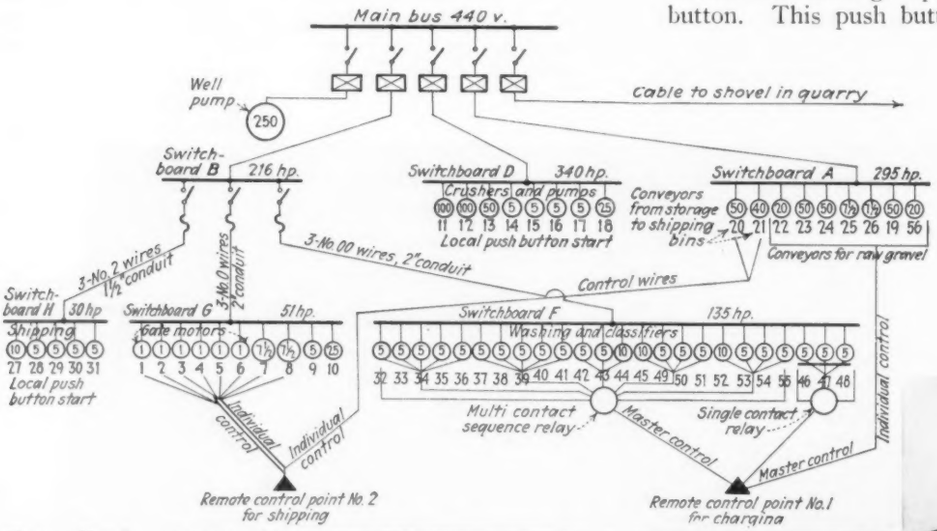
Group motor starting by centralized remote control eliminates lost time and energy losses

COSTLY delay and idle power consumption were eliminated in a recently rebuilt sand and gravel plant in California by substituting group remote control in place of the former method of local control for each motor. In the old plant considerable time was lost in going from station to station to start motors and there was considerable energy wasted in running motors before the whole plant had started production.

To obviate these losses in the new plant two master control stations were established, one for conveying, washing and classifying the raw material and the other for blending, final washing and shipping of the product. Bringing up the raw material from the pit, washing and classifying it and delivering the classified material to storage bins is called the "charging" end of the plant

The "charging" control station is located in the "pulpit," which is surmounted by a flag, as seen in the accompanying illustration. From this point an excellent view is available of belts and machinery, as both the conveyor framework and the headhouse are of open construction and directly exposed to the elements. In this pulpit are twelve "start" and "stop" push buttons assembled in a single housing for the control of individual motors or of motor groups.

The elevating conveyors, on account of the importance and size of the motors, are individually started. The washing and classification machinery and the short transfer conveyors all perform a co-ordinated service, and advantage was taken of the small motor sizes involved to start this entire group of machinery from a single push button. This push button energizes the operating coil of a multifinger relay, the fingers of which close in sequence with adjustable time interval. Each finger of this relay actuates the closing circuit of three or more magnetic motor starters. The number of motors controlled depended upon the individual sizes, the aim being to limit



Centralized remote control system that reduced plant starting time and saved energy

Remote control for all motors in charging end of sand and gravel plant is located in pulpit overlooking entire conveyor system

the starting current to the equivalent current taken by a single 30-hp. motor.

The time interval of closing between each finger requires proper adjustment to produce even increments of starting current, but where small motors are involved the acceleration is rapid and the over-all time of starting is small. All motors in the washer and classifier group were of the high-starting torque type, directly connected by speed changers to their loads.

A careful check of the power input to the main bus showed that the instantaneous demands of the large motor group did not transgress the power company rules nor adversely affect the demand feature of the rate schedule. While no fixed rule can be laid down, it will usually work out that group starting can be practiced where the total group starting current does not exceed that of the largest single motor permitted by rules of the serving utility.

Interlocking prevents pile-ups

The problem of concentrated control and rapid starting was not the only one encountered in connection with the charging end of this plant. The 21 motors that constitute this installation are so co-ordinated that the stoppage of any single motor interrupts the entire train of operations. To meet this condition the magnetic starters of all motors in the group are interlocked for sequence starting and the group as a whole is interlocked through the multi-contact relay with the raw material conveyors, which are in turn interlocked with each other.

With such a complicated relationship, it was very essential that some quick method of segregating troubles and of carrying out routine tests be embodied in the design. This flexibility was obtained by the installation of special control transfer switches located at each magnetic starter so that any motor could be quickly switched from the interlocked train and converted to local push-button control. The control was further connected so that each motor was fully protected against low voltage and overload when operating in the "local" position.

Five switchboards furnish energy to the various motors in the plant. These switchboards are built of stretcher leveled steel, the disconnecting switches being mounted in inclosed pockets with external handle and the magnetic starters in corresponding position to the rear. Disconnecting switches were equipped with auxiliary fingers connected in the control circuits to prevent feed-back of energy. The switchboards are located approximately at the mass centers of the various motor groups and permit of compact grouping of motor starters, which is of great importance when locating trouble and for routine maintenance.

All control wire was No. 14 single-conductor wire, ganged in a comon conduit from the switchboards to the master control stations. All control wires are operated at 440 volts, the voltage rating of the motors, and the wires terminate in fanning strips for convenience in tracing.

In handling the product from storage to shipping bins six gate motors and four conveyor motors are connected to the second master control station located on top of the shipping bins not shown in the illustration. The motors are interlocked and equipped with control transfer switches in similar manner to the charging station.

For detached and intermittent operations, such as crushing and returning of "oversize," sump pumps, etc., the control is either by hand compensators for the large motors or local push-button control for the small motors.

The accompanying schematic diagram shows the general features of the control system herein described.

Operating results

With the concentrated high-speed control system in operation no motors are started at the beginning of a shift until a few minutes before the whistle and the plant is in full production immediately. This has resulted in minimum labor and no energy waste during idle periods. The complete interlock existing between all motors operating in a train has resulted in the absence of jams and the centralizing of starting equipment has resulted in a minimum of maintenance.

It is believed that this system could be installed to advantage in many industrial plants having similar characteristics. For with adequate signal systems and proper guarding of machinery it is no longer necessary to see the equipment being started.

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Light and the Human Machine

By M. LUCKIESH

Director Lighting Research Laboratory, General Electric Company, Cleveland, Ohio

A study of some of the physiological effects of a day's work has been made and certain facts ascertained which are readily associated with the influence of lighting. The eyes of the subjects were tested at the beginning and again at the close of the day's work. In addition, the subjects were required to perform a rather mechanical and visual task, and the rate of working, accuracy and attentiveness to the work were determined. The afternoon results are compared with those of the morning in the following:

Visual acuity decreased 2 per cent.
Eye muscle-balance changed 5 per cent.
Attentiveness to task increased 14 per cent.
Delay in correcting errors decreased 2 per cent.
Amount of work done increased 4 per cent.

It is to be noted that, although the eyes showed evidence of fatigue and strain, the performance of work was greater at the close of the day than at the beginning. This result is typical of that obtained in other experiments. Such a situation, in which increasing production takes place with decreasing ability to produce, forms a combination which is detrimental to the welfare of the worker and results in excessive fatigue and losses in nervous energy. The rate of working, therefore, is not an indication of fatigue, since the results often indicate the opposite effect. If such data are superficially interpreted, human beings have the status of mere work-horses. The new science of lighting for seeing must include a consideration of the cost in eyesight and well-being of the workers as well as the economic phases of lighting, such as increased production and cost of the lighting.

More and better lighting improves visibility, makes the task easier and enables a greater proportion of the

energy available for work to be converted into useful work. Better lighting, by making the task easier, increases the "factor of safety." The beneficial effects of good lighting are very narrowly interpreted if they are measured only by production and the effect on the functioning of the eyes and of the human machine is ignored.

▼

Drained Transmission Lines Resist Lightning Outages*

Lightning surges have been successfully drained from transmission conductors without line trip-outs. The Arkansas Power & Light Company has made experimental installations of a drainage scheme on two 110-kv. H-frame lines and the subsequent performance of these lines has been very encouraging. This method seems to have possibilities of effecting substantial improvement in the performance of transmission lines and also has the advantages of simplicity and economy when compared to the more familiar method of diverting lightning from transmission conductors by overhead ground wires. However, additional operating experiences with both methods are necessary before definite conclusions can be drawn of the relative merits and applications of the two schemes.

The principle employed consists of discharging the surge from the conductors to earth through arc interrupters which quench the dynamic follow-up current before relays have operated to open the oil circuit breakers. The drain point structures are so designed that the breakdown between each conductor and earth is lower through an air gap and interrupter than through a path over the insulators. The spacing of the drain points along the line might vary from one at each structure to several spans apart, depending upon a number of factors, including the insulation to lightning voltages (between conductors and ground and phase to phase) on the intermediate structures, grounding conditions, span lengths and the degree of immunity desired. Considerable experience and further investigation will be required to determine the most effective spacings for different types of construction and conditions.

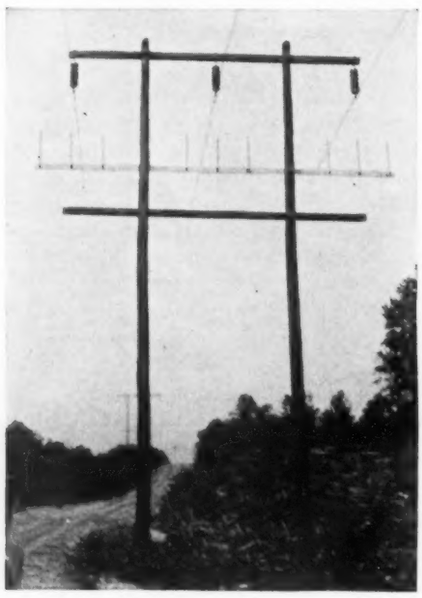
In the earlier experimentation conducted by R. R. Pittman, electrical engineer Arkansas Power & Light Company, an expulsion type fuse was used as the arc-interrupting device. However, the replacement cost, together with the desirability of installing two or three fuses at each location to give a repeater action, prompted Mr. Pittman in the development of an arc-interrupting device, here described. This device consists of a reduced air gap between electrodes and an open-ended fiber tube and its performance is similar to an expulsion fuse. except that it is capable of functioning repeatedly until the tube is destroyed. Paper wads inserted in the lower ends of the tube are used as operation indicators.

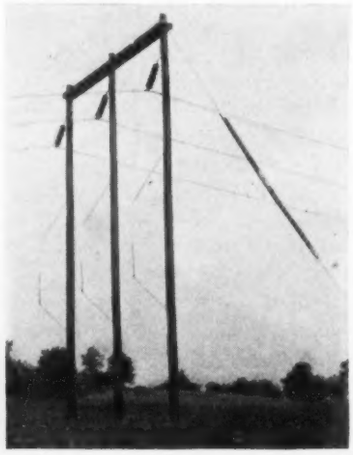
One drainage scheme installation was made on the Camden-Magnolia line, 32 miles long, equipped with an oil circuit breaker at each end so its performance records could be readily analyzed. Drain points were located 1½ miles to 2 miles apart and on the intermediate structures no bonding or grounding wires or guys were installed on the wood crossarms and poles, giving the maximum lightning insulation to ground and between phases.

Expulsion type fuses rated at 69 kv. were used to interrupt the dynamic arcs. In general, three fuses mounted on a crossarm underneath each power conductor were installed to provide repeating action. During the latter half of the 1930 lightning season thirteen fuses were blown, which were attributed to seven lightning strokes. Only one of these lightning strokes caused a line trip-out and in this case an intermediate structure flashed

See also "Lightning Investigation on a Wood-Pole Transmission Line," by R. R. Pittman and J. J. Torok, a paper presented at the 1931 mid-winter convention of the American Institute of Electrical Engineers.

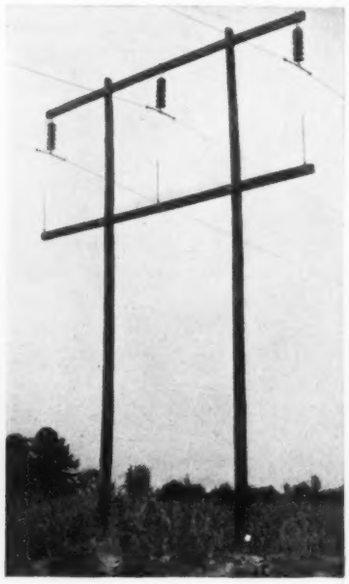
Left—Drain-point structure using expulsion fuses





Center—Three-pole drain-point structure using arc interrupters

Right—Two-pole drain-point structure using arc interrupters



over. For the 1931 season the separation between drain points was reduced to approximately 1 mile and up to August 15 there were sixteen fuses blown and two arc-interrupter operations. Analysis of the patrol observations indicated thirteen separate lightning flashovers on the line, eleven discharging only at drain points with no line trip-outs and two flashing over structures between drain points causing line trip-outs. In one instance a structure approximately 1,000 ft. from a drain point was flashed between phases along the unbonded crossarm, while in all other cases the distances to drain points were considerably greater. This occurrence indicated the necessity for closer spacing of drain points and additional ones were recently installed to make their separation approximately ½ mile. No operating experience has been obtained to date with this arrangement.

Another drainage installation was made on approximately 25 miles of the Magnolia-Okay 110-kv. H-frame line. In this case the drain points were spaced 1½ to 2 miles apart. Since this represented only one-half of the line and the balance was of conventional construction it is not possible to correlate definitely the performance of the drainage scheme with that of the line as a whole. Arc interrupters were used instead of fuses. In 1930 eight interrupter operations were recorded, and thus far in 1931 six operations have occurred, all functioning apparently as intended.

This drainage scheme is still in the experimental stage, but developments are being made as experience is obtained. The scheme is being applied to an important line now under construction and the experience thus far has been very encouraging as there have been enough fuse and arc interrupter operations without accompanying line trip-outs to demonstrate the real merit fairly well.

▼

Embrittlement Study of Galvanized Steel Making Progress

Causes of embrittlement of hot galvanized steel are not being confined to structural shapes in the study being conducted by the Battelle Memorial Institute of Columbus, Ohio, for the A.S.T.M. subcommittee on embrittlement investigation. In addition to a study of 50 heats of steel, including bessemer, duplex and open hearth, miscellaneous samples, including pole-line hardware, have been subjected to critical study.

The samples have been tested "as-rolled," "as-pickled," "as-pickled and galvanized" and "as-galvanized without pickling" in an effort to segregate the effects at different stages of the galvanizing process. Also the effect of punching, reaming and drilling, cold-working, compression and chemical composition are being sought in the tests now in progress.

So far in the investigation it appears that galvanizing itself, independent of the pickling, impairs the ductility of punched steel, some steels being much more susceptible than others. Indications have already been found that pickling and galvanizing contribute independently of each other to the embrittlement. The study is being continued.

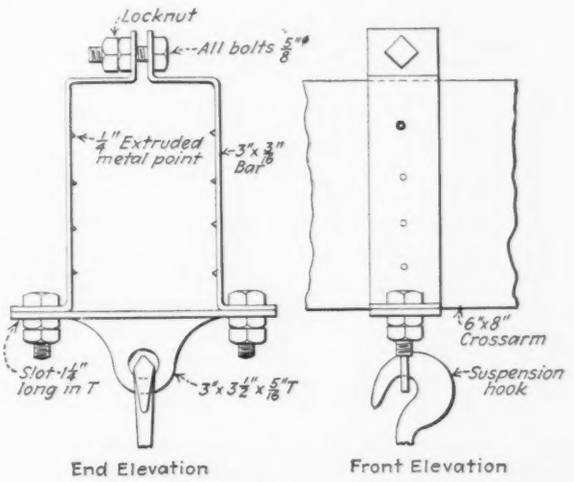
Three-Piece Insulator Bracket for Wood Crossarms

By H. V. INGERSOLL

Stone & Webster Engineering Corporation, Boston

In designing the 110-kv. transmission line between Petersburg, Va., and Roanoke Rapids, N. C., for the Virginia Electric & Power Company, the Stone & Webster Engineering Corporation gave particular attention to the details for the attachment of insulators to the wood crossarms on the single-circuit wood H-frame structures. In order to minimize possible damage to the wood at the point of insulator attachment caused by lightning flashovers a steel bracket was designed to give wide contact surface around the arm. The usual bolt through the arm to hold the attachment in place was omitted, as previous experience indicated that seasoning of the wood often caused it to split back from the end of the arm, with the resultant loosening of the attachment and sometimes its loss.

The details of the bracket, which was developed for the 6x8-in. crossarm used on this line, are shown in the accompanying illustration. The bracket is made up of three pieces, two of which clamp around the sides and top of the crossarm, and the third which clamps at the bottom of the arm to support the insulator hook. A standard steel tee section was used to form the latter part of the bracket because of its strength against lateral and longitudinal forces.



Bracket designed to minimize lightning damage and facilitate line assembly

As the crossarms were of rough dimensions, provision was made for variations in the size of the wood by slotting the bolt holes in the tee section. In order to provide a better grip on the wood to keep the bracket in position the metal was punched to give a few extruded tips which penetrate ¼ in. into the wood. Lock nuts were used on all bolts to safeguard against their loosening. An advantage of this band over previous single-piece bands that had been experimented with is that it can be easily assembled on any part of the crossarm.

Electric Heat for the Metal

By J. C. WOODSON

Manager Industrial Heat Engineering Department Westinghouse Electric & Manufacturing Company, Mansfield, Ohio

WITHIN recent years certain industries, such as the electrical, wire manufacturing, strip and tube mill and the automotive, have developed better and more reliable annealing practices, but the great bulk of raw metal from large mills is still being either improperly annealed or is shipped to the user in the unannealed condition. The demands of large fabricating plants, such as automobile plants, and also the urge of close competition are bringing about a rather rapid, and in some ways remarkable, change in these conditions in that the large steel metal mills are being compelled to produce at their plants raw materials such as sheet, tubing, shapes, castings, etc., to meet definite and rigid specifications as to hardness, strength, grain size and structure, surface finish and condition. This trend is so pronounced and successful that it may be considered epochal in the metal industries, and within a very few years such will in all probability be universal practice. The user or fabricating plant will then be able to produce better and cheaper products than at present. Such refinements represent the real potential market of the future for better manufacturing methods and equipment.

It is always difficult and hazardous to attempt to predict what the future will bring in a rapidly expanding industry, so only a few of the present tendencies and possible developments will be enumerated:

First—A rather rapid and extensive expansion of electrical annealing, bright and semi-bright to the wire, strip and sheet mills generally. It is believed that this will be necessary from an economic and competitive cost standpoint, if from no other. These economies result from lower maintenance, lower operating costs, shorter cycles, better products, fewer subsequent operations, long tool and die life, fewer rejects and returns, etc. These are actual tangible and measurable quantities and need not be the subject of opinion or speculation.

Second—The use of artificial furnace atmospheres to secure special and better results will in all probability be more generally adopted throughout the steel and metal trade. Especially will the near future see it adopted in fabricating and manufacing processes purely as an economic measure to eliminate unnecessary operations.

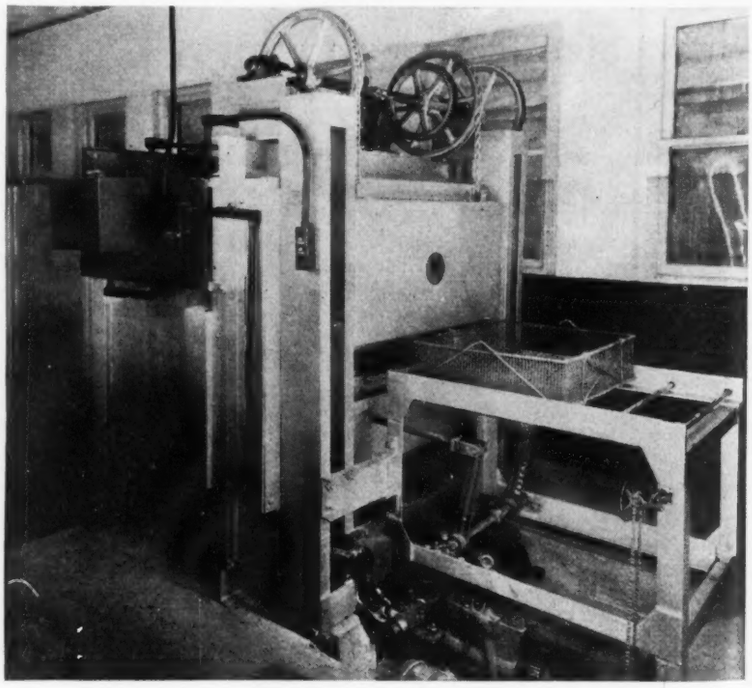
Third—There will be developed more of the large continuous electric furnaces for sheet annealing and normalizing, and with artificial atmospheres. A great deal of engineering thought has already been put on this subject, but as yet a design generally suitable has not been evolved. One or two applications have been made of overhead conveyor furnaces, such as those now used for vitreous enameling, but these are only partially successful where bright anneal is considered. Successful small electric annealing furnaces for small parts are numerous now, but these designs cannot be extended to the sizes required for large tonnages of sheet and strip.

Fourth—There will be a rather extensive development and application of the principle of inductive heating to numerous heat-treating processes now considered unsuitable. Among these will be annealing and normalizing of sheet and strip, perhaps continuously and rapidly, such as between passes in the mill. Annealing of structural shapes and especially tubing by this means is certain to come. Some work along this line has already been accomplished, with more to follow shortly. This work is still in its experimental stage and is not yet ready for the market. A few years more may see this principle so developed as to be attractive for both high and low temperatures.

It is unlikely that there will be much of a revival of the direct heating processes, such as the "Snead process" of passing current directly through wire, strip tubing, etc. While this method possesses attractive features, its application is fraught with control and practical difficulties of such character as to preclude its general adoption as far as we can now determine. The future may of course eliminate some of these shortcomings.

Annealing brass tubes

Within the last two or three years, progressive brass mills have been studying their heat-treating practices.



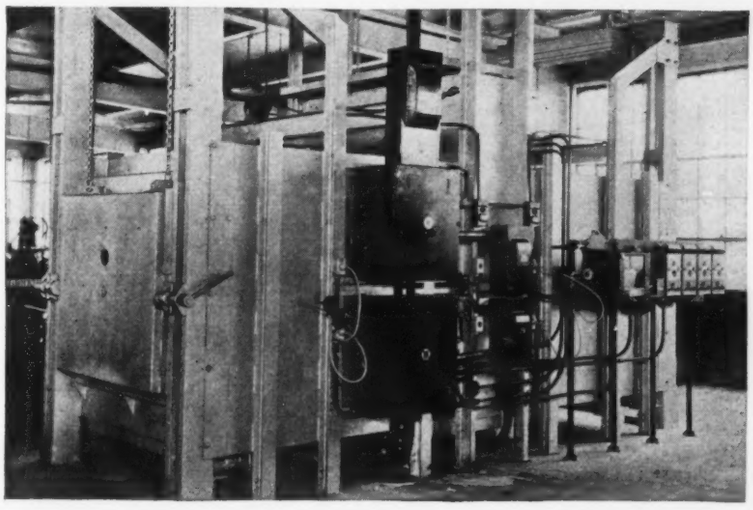
Walking-beam type furnace for annealing short brass tubes

**Abstracts of "Electrically Heated Annealing Furnaces for the Steel and Other Industries," a paper presented by Mr. Woodson before the Middle Eastern district meeting of the American Institute of Electrical Engineers.*

Industries*

They recognize the advantages of electric heat, but question the cost. Rough anneal is carried on at 950-1,350 deg. F. Finish anneal is usually at 1,050-1,300 deg. F. The economies to be expected are 18-26 lb. a kilowatt-hour and a survey of several plants indicates actual money savings of 75 cents to $2.50 a ton over fuel-fired equipment. Such savings on large tonnages result in returns

Truck-type furnace for annealing aluminum sheets



Two-temperature furnace for annealing airplane parts of aluminum alloys

on the investment as high as 50 per cent per annum, besides producing better products.

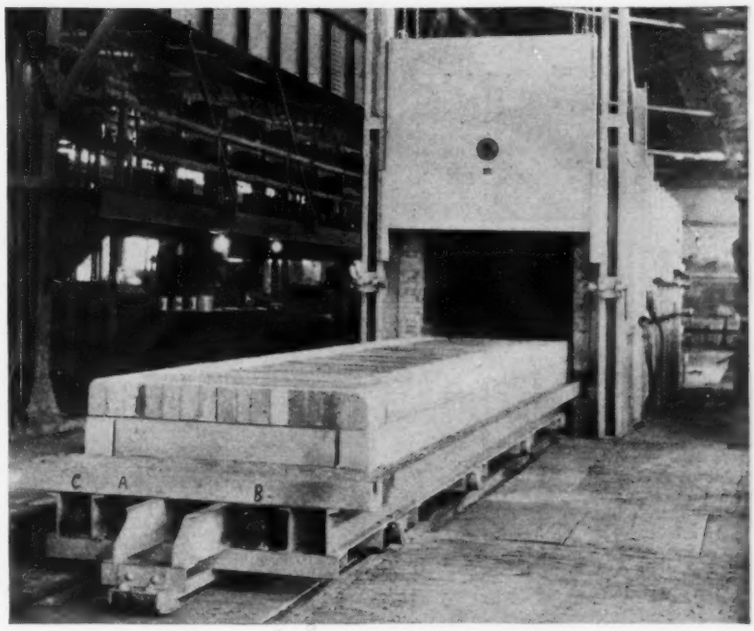
Annealing aluminum sheets

Sheet aluminum is annealed to relieve rolling strain and to obtain proper grain structure for drawing and forming. Aluminum castings are annealed to remove casting strains, refine the grain and improve machinability. The temperatures range from 550 to 1,000 deg. F. Temperature control uniformity must be close, ± 5 deg. F. often being required.

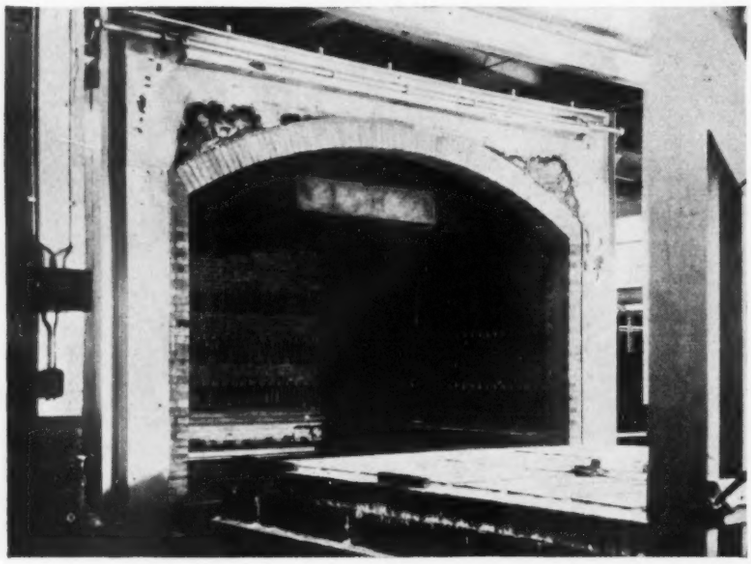
Electric furnaces for annealing fabricated parts require such close temperature distribution that circulating fans must be employed in the furnace chamber.

"Double" annealing of steel

The object of heat-treating iron, carbon steel and alloy steel castings is aging, relief of casting strains, improved machinability and securing proper grain structures. These results can be secured with such certainty, uniformity and regularity in the electric furnace that lower-priced fuels are often ruled out in face of the apparently higher operating



Car-type furnace for "double anneals" of steel



Cooling ducts and heaters on the door of furnace for annealing large elements

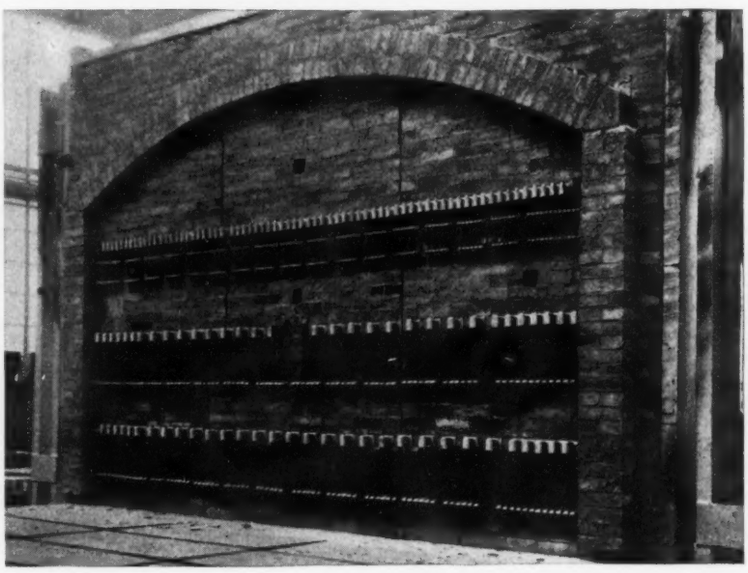
costs by electricity. The economies for casting annealing range from 8 to 15 lb. a kilowatt-hour. Temperatures range from 950-1,650 deg. F. for carbon steel to 1,950 deg. F. for manganese steel. Definite rates of cooling are obtained by means of cooling ducts or pipes through the chamber or charge. With "double anneals" the cooling rates are just as important as the heating rate.

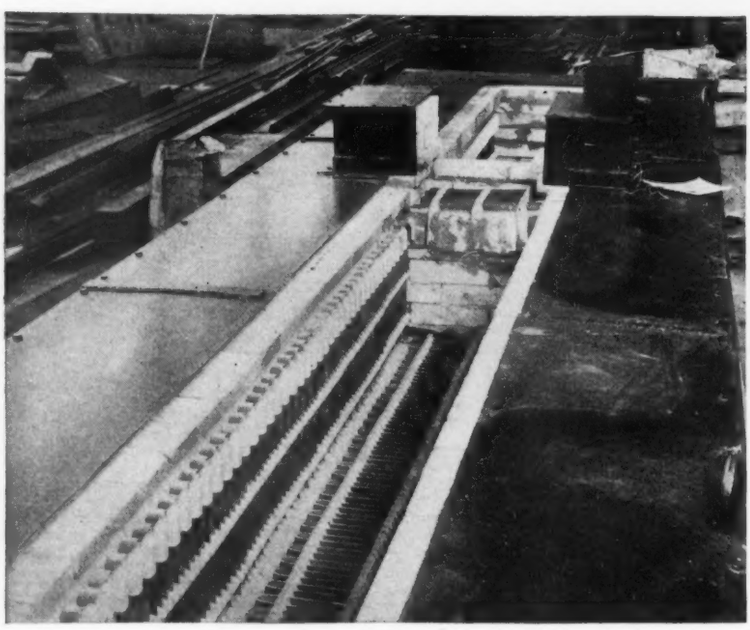
Annealing steel wire

A maker of steel wire for bridges and similar applications has installed large electrically heated lead bath furnaces and heat treats ten or twelve strands running in parallel through the lead at once. Other heat-treating operations, such as hardening, quenching and drawing, follow the same scheme. The product is much superior to that of former methods and the over-all cost is less.

Annealing large parts

Large welded shapes, such as tanks, motor and generator frames, turbine parts, etc., are annealed to relieve welding stresses and produce proper grain structure to give maximum strength and toughness. Cost data on these large furnaces are not available, but the users feel the results obtained justified the investment. For some cases these results cannot be secured in any other way regardless of cost.





Annealing cold-rolled strip

To obviate uncoiling and recoiling, cold-rolled strip electric furnaces of the "bell" type have been devised. The coils are stacked one on top of the other on a base, as illustrated, a sheet-metal hood is placed over the charge and the loaded base is put in position beneath the "bell," which is then lowered over the charge and "locked" with a liquid seal to prevent the escape of the gas constituting the artificial atmosphere under the hood.

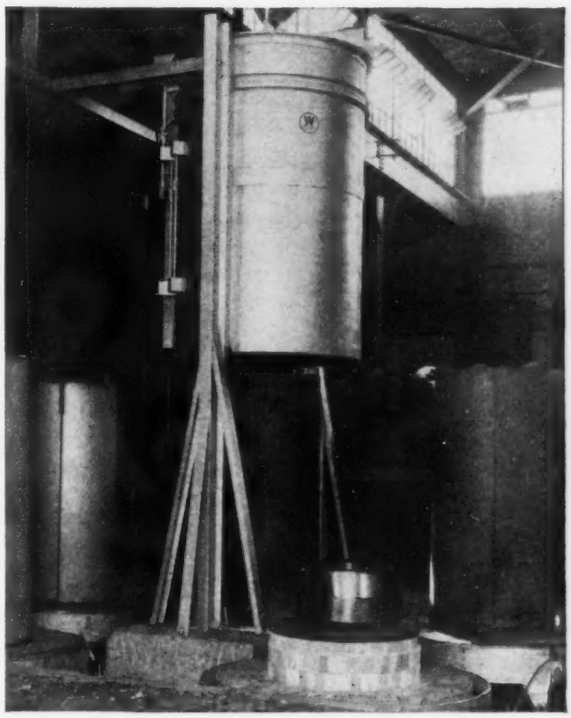
Continuous wire-annealing furnace

Actual test runs on both gas-fired and electric furnaces extending over a period of several months indicate the following operating costs for the two months:

	Cost per Ton Gas-Fired Furnace	Cost per Ton Electric Furnace
Labor, Maintenance, Miscellaneous	3.05	1.45
Fuel	2.15	1.40
Total per ton	5.20	2.85
	2.85	
Saving electric over gas furnace...	$2.35	

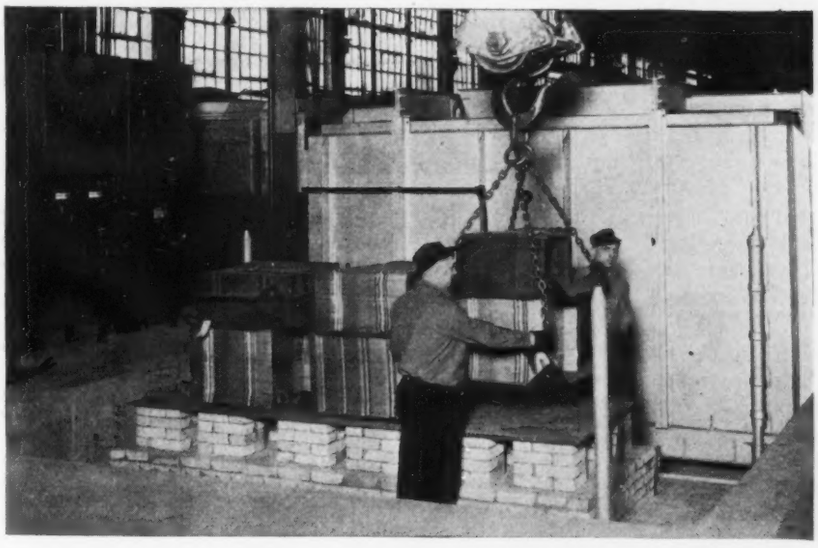
Such savings with companies making 300,000 to 600,000 tons a year amounts to real money and will show a return on the furnace investment of approximately 200 per cent. These savings do not include such items as "better working conditions," "better product," "fewer rejects," etc., but are actual operating costs.

To the above figures should be added the cost of the reducing gas, which also is less for electric furnace, but since this cost will vary with the gas used, geographic location, product treated, etc., it will be disregarded here. The above figures are based on 550 B.t.u. city gas at 35 cents per thousand and electricity at 8 cents per kilowatt-hour.



Pack annealing of large-size high-silicon sheets and punchings

"Bell" furnaces for annealing cold-rolled strip in coils

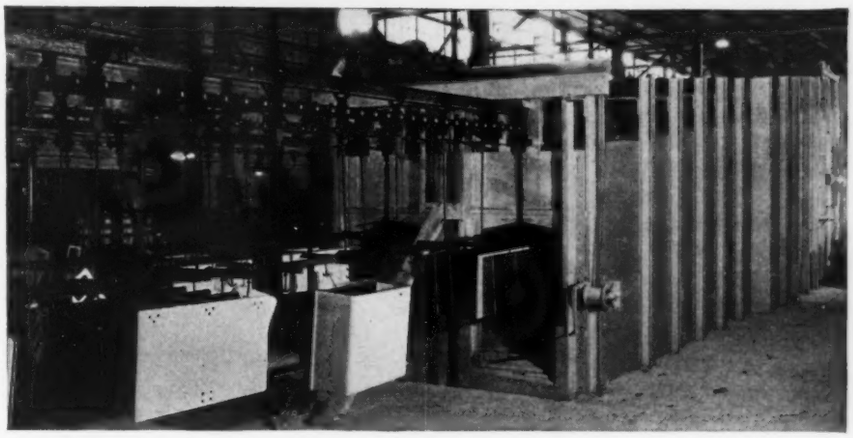


Pack annealing of sheets

With several bases per "bell" type furnace operation can be virtually continuous and show direct economies. Such furnaces to a considerable number are now in operation in capacities up to 60,000 lb. per charge. Here also the rates of heating and cooling are as important in securing the proper magnetic qualities as are uniform temperature distribution and automatic control.

Vitreous enameling

Such equipment will be developed for continuous annealing and normalizing of sheets, but a general design that is suitable for bright annealing in artificial atmospheres has yet to be developed.



Overhead conveyor type furnace for vitreous enameling

Power and Process Steam Cost Allocations

For the calculation of costs of electricity and process steam services from the same power plant there is needed a basic energy unit from which these costs can be derived in a simple, easily understandable way. Such a unit is suggested as 1,000,000 B.t.u. under the name of "dekatherm" by Harold A. Lynette, of V. D. Simons, Inc. Quoting Mr. Lynette:

"Steam at pressures ranging from 175 lb. absolute to below one pound with a temperature range from 400 deg. to 90 deg. F. are required by the process industries. Process steam should be supplied to these industries from suitable extraction nozzles of a condensing turbine generator unit. Each extraction for process requires a specific number of B.t.u.'s per pound of steam from fuel, varying with the pressure, temperature and efficiency of generation. Every kilowatt-hour will require a specific number of B.t.u.'s, depending upon the over-all thermal efficiency of the plant supplying the energy.

"We are, therefore, dealing basically with B.t.u.'s regardless of their conversion into varying grades of heat and energy with varying rates of efficiency in generation. If we accept 1,000,000 B.t.u. as the unit of cost we have a simple, easily determined unit for the determination of the cost of supplying steam at varying pressures and temperatures and of supplying energy in a wide range of ratio to steam consumption.

"Estimates on two proposed developments are given in Table I. Plant A is designed to supply initially one industrial consumer, while plant B is designed to supply two industrials. For these developments the power plants are designed as utility base-load generating stations; the supply of steam for process is the by-product. The plants are designed on a predetermined heat rate of from 7,000 B.t.u. to 9,000 B.t.u. per kilowatt-hour net from fuel.

"In order to secure the economy of design the plant should be operated so as to maintain the average heat rate. This can be accomplished by maintaining the total energy generation on a definite ratio to total extraction for process. The condensing operation will require from 30 to 40 per cent of total generation. This method of operating will maintain the design heat rate regardless of variation in the average demand for process steam due to changes in production schedules.

"The items under A and B in Table I show how the 1,000,000 B.t.u. is applied for obtaining the cost of service to combined steam and power consumers. Development B is desired to serve two industrials, I and II, with a wide variation in steam and energy requirements, but the average 1,000,000 B.t.u. cost covers their total costs for service correctly, as is shown in Table II.

"Table III illustrates clearly that the 1,000,000 B.t.u. charge differentiates between the cost of supplying process steam for various pressures and temperatures. For this reason additional industrial steam and power consumers can be added to any previously built power plant designed for such service provided suitable extraction pressures are available. If the additional consumers make additions to the plant capacity necessary no disturbance will be created in costs to existing consumers unless the proportion of spare capacity in both boilers and turbines is materially changed."

Table I—Allocation for Combined Steam and Power Use

	A	B
Energy Distribution		
Plant capacity, kva	25,000	27,500
Load factor, per cent	68.57	70
Average heat rate, B.t.u.	8,000	7,712
Fuel cost per ton	$4.10	$3.94
B.t.u. per pound of coal	13,774	13,899
Net kilowatt-hours to industrials	43,300,000	44,580,000
Net kilowatt-hours to utility	77,125,000	90,320,000
Net kilowatt-hours total generation	120,425,000	134,900,000
1,000,000 B.t.u. Power Plant Dissipation		
1,000,000 B.t.u. to process from fuel	1,056,881	2,027,400
Per cent of total	52.31	66.09
1,000,000 B.t.u. to energy from fuel	963,400	1,040,366
Per cent of total	47.69	33.91
1,000,000 B.t.u. total dissipation a/c process and energy from fuel	2,020,281	3,067,766
Power Plant Costs		
Fuel	$300,674	$469,845
Operating	175,649	165,480
Fixed charges	280,000	311,572
Total	$756,323	$946,897
Per 1,000,000 B.t.u. from fuel, cents	37.44	30.86
Industrial		
1,000,000 B.t.u. a/c process	1,056,881	2,027,400
1,000,000 B.t.u. a/c energy	346,400	343,816
1,000,000 B.t.u. a/c total	1,403,281	2,371,216
Per cent total plant dissipation	69.46	77.29
Total cost at respective 1,000,000 B.t.u. costs	$525,341	$731,857
Utility		
1,000,000 B.t.u. a/c energy	617,000	696,550
Per cent total plant dissipation	30.54	22.71
Total cost at respective 1,000,000 B.t.u. costs	$230,982	$215,040
Cost of energy, based on average cost per 1,000,000 B.t.u., will be per kilowatt-hour, cents	0.299	0.238
Ratio of energy to 1,000,000 B.t.u. dissipated a/c process, kilowatt-hour	40.97	22

Table II—Allocation Between Two Widely Different Industrial Uses

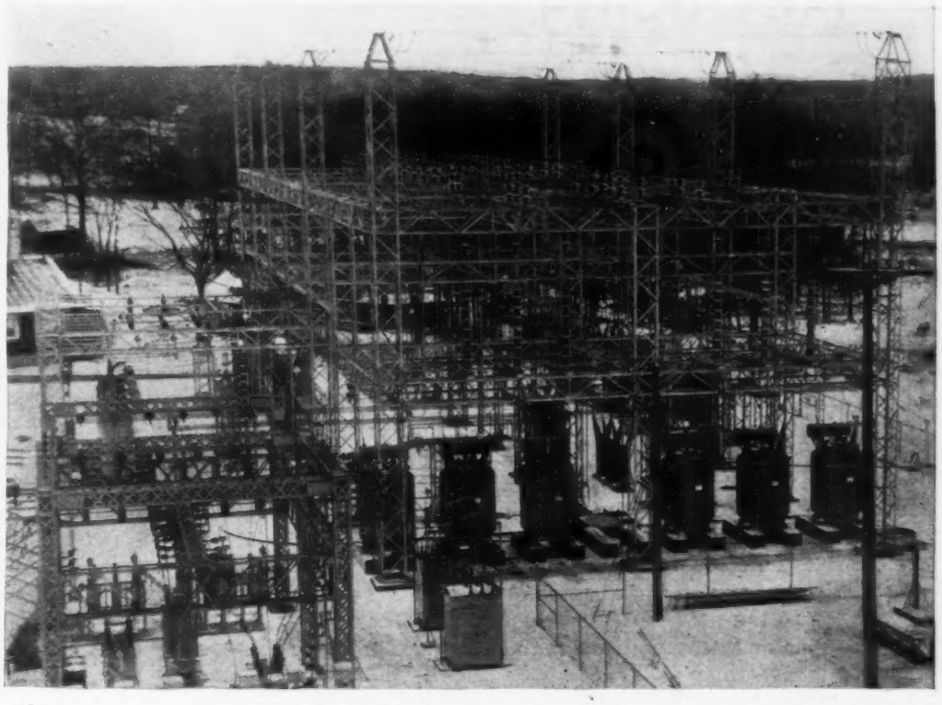
Industrial I.	
Energy per 1,000,000 B.t.u. dissipated a/c process, kilowatt-hour	5.52
1,000,000 B.t.u. dissipation a/c process	453,008
1,000,000 B.t.u. dissipation a/c energy	19,280
1,000,000 B.t.u. dissipation a/c total	472,288
Cost at 30.86 cents per 1,000,000 B.t.u.	$145,770
Industrial II	
Energy per 1,000,000 B.t.u. dissipated a/c process, kilowatt-hour	26.73
1,000,000 B.t.u. dissipation a/c process	1,574,392
1,000,000 B.t.u. dissipation a/c energy	324,536
1,000,000 B.t.u. dissipation a/c total	1,898,928
Cost at 30.86 cents per 1,000,000 B.t.u.	$586,087
Cost to Industrial I	145,770
Cost to utility	215,040
Total cost	$946,897

Under development A the industrial requires the dissipation of heat in millions of British thermal units for process in accordance with Table III.

Table III—Method Applicable to Wide Range of Process Steam Conditions

Process Temp. and Absolute Pressure		Lb. Steam Hourly Includes Evaporators	1,000,000 B.t.u.		B.t.u. per Lb. of Steam	B.t.u. from fuel (at 83⅓ per Cent Eff.) per Lb. of Steam	Allocated Cost per 1,000 Lb. of Steam from Fuel at 37.44 Cents per 1,000,000 B.t.u.
			Hourly	Yearly			
Deg. F.	Lb.						
368	170	6,089	7.286	54,208	1,197	1,436	53.76
259	35	90,155	88.788	660,583	985	1,182	44.25
213	15	1,034	0.990	7,366	957	1,148	42.98
162	5	2,769	2.610	19,418	943	1,132	42.38
92	743	36,369	33.750	251,100	928	1,114	41.71
Totals		136,416	133.424	992,675			

Ground-Wire Protection on Substation Structure



Characteristic of recent lightning-protective practices on properties for which the Electric Management & Engineering Corporation has done the design and construction work is this Chatham substation of the Jersey Central Power & Light Company. Here the ground wires on the transmission towers are brought down to shield the substation equipment by connection to the vertically extended portions of the main steelwork columns. Thyrite arresters of the most modern type are mounted high on the structure.

Other interesting features of this station include extensive use of air-break switches in place of oil circuit breakers, installation of impedance-type relay for control of rapid circuit interruption under surge conditions, and reduced weight of station superstructure due to the small cross-sectional area of angles and strips used.

According to C. E. Lakin, electrical engineer of the Electric Management & Engineering Corporation, this design is highly satisfactory both as to performance characteristics and as to cost elements.

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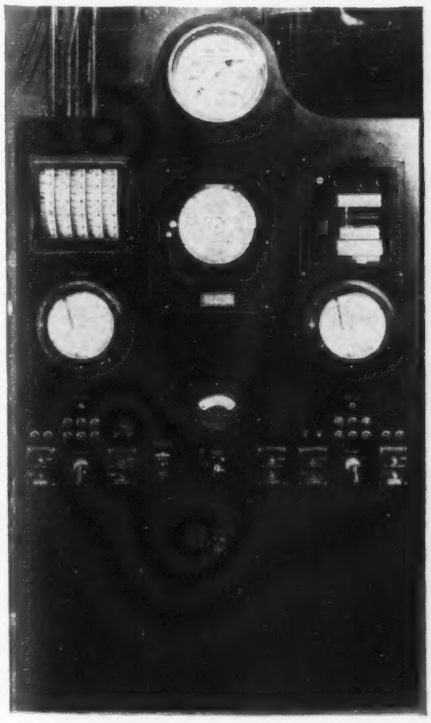
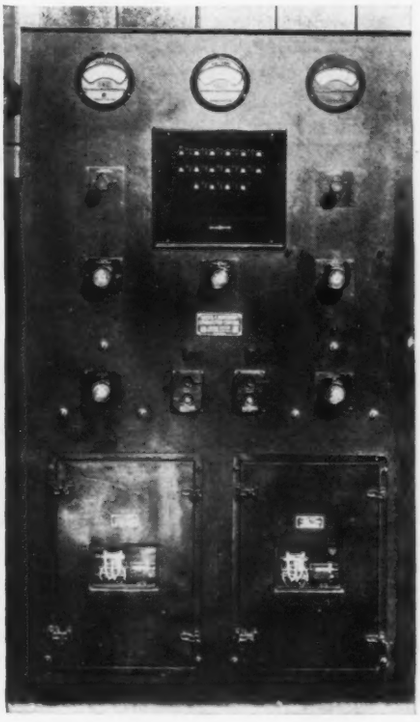
Centralized and Automatic Boiler-Room Control





By means of a master panel for the automatic, co-ordinated operation of local boiler control panels, steam generation at the James H. Reed station of the Duquesne Light Company, Pittsburgh, is placed upon a high plane of efficiency and the possibilities of error in securing balanced operating conditions are greatly reduced. The master panel and typical local panel illustrated include hand controls, but normal operation is through automatic recording and impulse control instrument. The single master panel controls local panels at and for each boiler.

Reducing Network Protector Operation

By JOHN S. PARSONS

General Engineering Department, Westinghouse Electric & Manufacturing Company

Some causes of unnecessary operation of network protectors are mentioned which will eventually lead to excessive maintenance costs.

Methods of avoiding these situations are discussed which, it is claimed, will not prevent the protector functioning when it is really necessary.

Limitations of use and factors that affect settings are also considered.

ON MANY low-voltage alternating-current network systems there are locations where the network protectors operate oftener than is necessary for the correct functioning of the system. These unnecessary protector operations are objectionable because they will eventually lead to excessive maintenance costs. Improper voltage regulation of the feeders supplying the network may be responsible for the too frequent operation of the network protectors, and in that case the trouble should be corrected by changing the method of regulation or the settings of the regulators. However, the excessive protector operations may be due to the difference in magnitude or phase angle or both of the voltages applied to the network transformers, together with load variations or fluctuations on the network. The difference in transformer voltages may be due to a number of things which cannot be readily corrected by means of voltage regulation. The feeders supplying the transformers may be connected to different station buses, the feeders may be of different voltages and unequally loaded because of their feeding different areas in the network, or one or more of the feeders may supply considerable radial load.

The too frequent protector operations are not likely to occur except when the transformers with which the protectors are associated are very lightly loaded. With considerable load on the transformers the voltage differences which occur are not likely to be enough to cause a reversal of current through the protectors and transformers. Regenerative braking of elevator motors may cause one or more of the protectors associated wth the transformer banks supplying the motor load to open, especially at times of light load on the transformers. When the motor load again comes on, the voltage on the network at the point where the protector or protectors are connected may drop enough to cause the protectors which have opened to reclose. This action may be repeated at frequent intervals, thus resulting in a considerable number of undesirable network protector operations.

Selection of reverse-current settings

In order to reduce to a minimum these undesirable network protector operations it is often necessary to set the protectors which are operating too frequently to open on a considerably higher value of reverse current than usual. The standard network protector can be adjusted to trip on values of reverse current from zero up to 2 or 3 per cent of the protector rating. Where a setting somewhat higher than this is needed, it is only necessary to equip the type CN-3 network master relay with a somewhat stronger reverse-current spring. However, a type CN-3 relay equipped with a strong reverse-current spring should never be given a reverse-current setting in excess

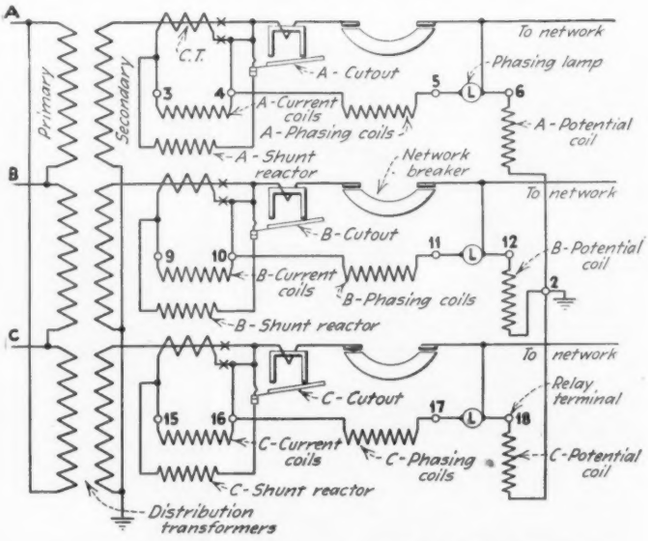


Fig. 1—Use of shunt reactor to obtain high reverse-current settings on protectors

A standard type CN-3 relay is used in conjunction with shunt reactors to control the network protector. The closing and tripping circuits are the same as those employed on standard protectors and have been omitted from the diagram to prevent unnecessary complication. The potential and phasing coils of the type CN-3 network master relay operate to close the network protector in the usual manner.

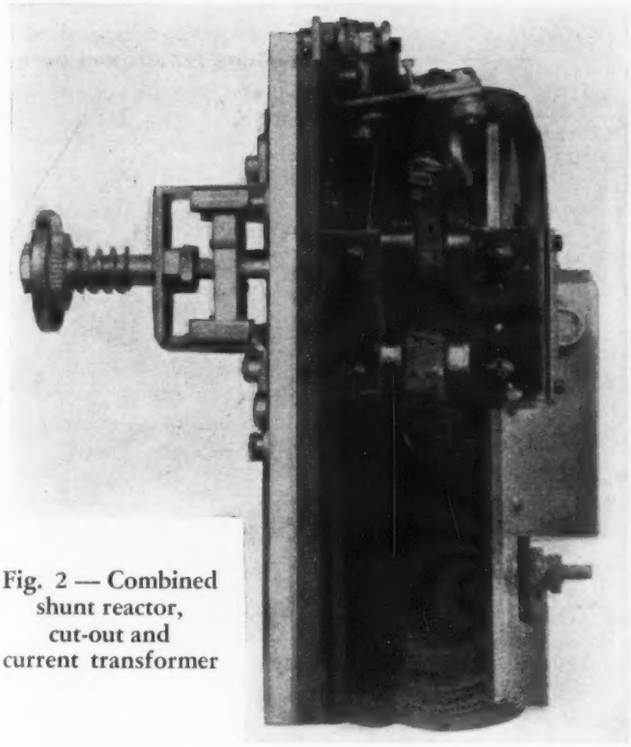


Fig. 2 — Combined shunt reactor, cut-out and current transformer

of 10 or 12 per cent of the protector rating, because if a higher setting is used there is a possibility that the protector may not trip under primary fault conditions. Where it is necessary to use a reverse-current setting higher than approximately 10 per cent of the protector rating in order to reduce or eliminate the too frequent operations of the protector, a method of securing reverse-current settings between approximately 7 and 25 per cent of the protector rating should be used. This method is known as the shunt reactor scheme.

Operating experience to date indicates that for the great majority of applications network protectors will operate satisfactorily when given a reverse-current setting equal to 2 per cent of the protector rating or less. This usual sensitive setting of network protectors should be satisfactory in virtually all cases on a network fed over interlaced primary feeders which supply little or no other load and originate at the same station bus or different station buses connected by means of primary ties so that their voltages are substantially in phase and equal. The one case on such a system where a higher reverse-current setting may be found desirable is where a protector or protectors are located adjacent to motor loads employing regenerative braking. At these locations the use of a reverse-current setting equal to about 10 per cent of the protector rating or less, which can be obtained by means of the strong reverse-current spring, will in nearly all cases eliminate the undesirable protector openings.

The use of the strong reverse-current spring will also prevent protectors opening unnecessarily at a number of locations on a network fed over primary feeders which supply comparatively large radial loads or which originate at different station buses whose voltages are at times appreciably out of phase or different in magnitude. However, at some points on such a network a reverse-current setting greater than 10 per cent will often be required if too frequent protector operations are to be avoided. Such a setting for the protectors at these points, which will usually be where the impedance of the secondary mains between two transformers is less than the average, can be obtained by means of the shunt-reactor scheme.

Shunt reactor helps

A schematic wiring diagram of the shunt-reactor scheme for obtaining high reverse-current settings on network protectors is shown in Fig. 1. The closing of the network protector by means of the network relay connects the transformer to the network, thus allowing current to flow from the feeder through the transformer and protector to the network. The flow of this current through the primaries of the current transformers causes a current to flow in the secondaries of these current transformers. A part of this secondary current flows through the current coils of the type CN-3 relay, but the greater part of the current flows through the shunt reactors which are connected in parallel with the current coils. The fact that most of the secondary current flowing in the current transformers passes through the shunt reactors means that considerably more primary current must flow through the network protector in order to secure the same amount of current in the current coils of the network relay as would flow if the reactors were omitted. Of course, with the current flowing from the transformer to the network a torque is produced in the relay due to the action of the current coils and the potential coils to maintain the network protector in the closed position. However, when the current flow is in the reverse direction—that is, from the network to the feeder—a torque will be produced in the relay, causing it to close its tripping contacts and thus open the network protector.

The standard type CN-3 network relay can be adjusted to trip on in-phase reversals of from approximately 2.4-amp. to 24-amp. primary current when used with a 1,200-amp. network protector. Now, if shunt reactors are connected in parallel with the current coils of the network relay, as shown in Fig. 1, and are designed so that, for instance, 90 per cent of the current flowing

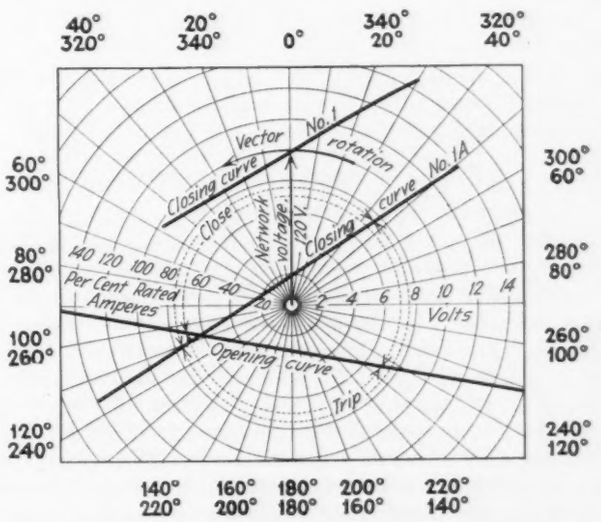


Fig. 3—Operating characteristics of CN-3 network relay used with shunt reactor

Values apply to 1,200-amp. network protector.

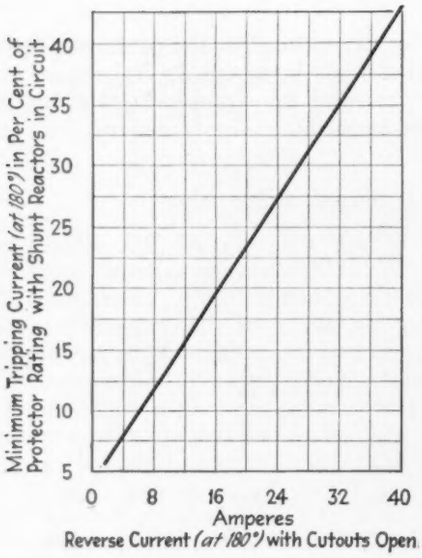


Fig. 4—Reverse-current settings of CN-3 relay with and without shunt reactor

Based on 1,200-amp. protector.

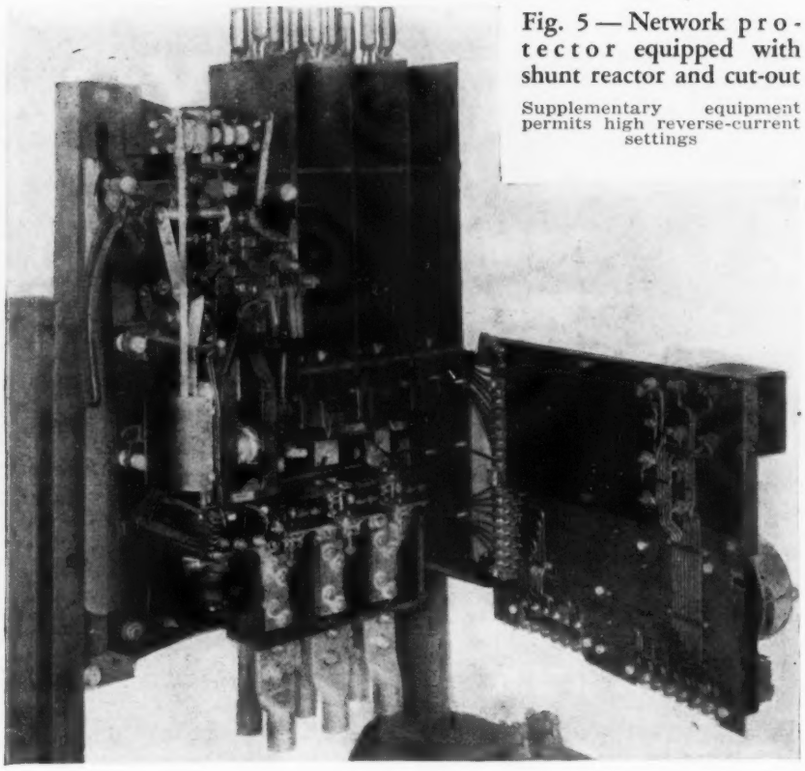


Fig. 5 — Network protector equipped with shunt reactor and cut-out

Supplementary equipment permits high reverse-current settings

in the secondaries of the current transformers passes through them, only one-tenth of the usual amount of current will flow through the current coils of the relay for a given amount of primary current. Therefore, ten times the usual amount of primary current will be required in order to secure a given amount of current in the current coils of the relay. For instance, if the network relay is set to close its tripping contacts on an in-phase reversal of 5 amp. primary current without using shunt reactors, when the shunt reactors are placed in parallel with the current coils a primary current of 50 amp. in-phase reversal will be required to cause enough current to flow in the current coils of the network relay to cause its tripping contacts to close. The shunt reactors are usually designed so that the relay may be set to trip the network protector on any appreciable value of in-phase reverse current desired up to approximately 25 per cent of the protector rating.

Cut-out shunt reactor on faults

In designing the shunt reactors care must be taken to see that they, together with their leads, have the same power factor as the current-coil circuits of the network relay, if the phase-angle tripping characteristics of the relay are not to be changed by connecting the reactors in circuit. The phase-angle characteristics of the network relay when used with the reactors can be changed considerably by varying the power factor of the reactor circuits. It is usually desirable so to design the shunt reactors that when they are used with the network relay its tripping curve is rotated in the clockwise direction from the horizontal or true wattmeter position. This is done so that should the cut-outs fail to operate the operation of the network relay will be more reliable on low lagging-power-factor reversals. It is usually very difficult to rotate the tripping curve more than a few degrees beyond the horizontal position in the clockwise direction.

In order to secure reliable and high-speed operation of the network relay under the various fault conditions encountered, it is necessary to open the circuits of the shunt reactors when a fault occurs. This is done by means of the contacts of the cut-outs. The cut-outs are nothing more than circuit-opening contactors and are arranged to have a single turn coil. The iron circuits of the contactors or cut-outs, so called because they cut the shunt reactors out of the circuit when they operate, are assembled as a unit with their contacts, the shunt reactors, and the current transformers and are placed around the poles of the network protector. The cut-outs are usually set so that they operate to open their contacts when the flow of primary current reaches a value equal to approximately 150 or 175 per cent of the network protector rating. Since the cut-outs operate only on current and do not take into consideration the direction of power flow, it is desirable that the pick-up and drop-out values be as close together as possible. The drop-out point should, of course, always be above the value of current for which the network relay is set to trip when the reactors are in circuit.

With the shunt-reactor scheme, under normal system conditions, the network protector is rendered insensitive by means of a directional high reverse-current controlling scheme which tends toward stable operation. Under fault conditions or when the current through the network protector exceeds the value for which the cut-outs are set, the scheme is altered so that the protector is controlled by a sensitive reverse-current relay which makes for fast and reliable operation under primary fault conditions. Briefly, this scheme changes from a high reverse-current setting under normal conditions to a low reverse-

current setting under fault conditions, and the point at which the change in the setting is made depends upon the point at which the cut-outs are set to operate. The value of the high reverse-current setting obtained under normal conditions is determined by the design of the shunt reactors and the reverse-current adjustment of the network relay.

Performance with and without shunt reactors

The relation between the reverse-current setting of the network relay when used on a 1,200-amp. network protector with and without the shunt reactors in circuit is shown in Fig. 4. For instance, suppose it is desired to set the network relay so that a 1,200-amp. protector which is equipped with shunt reactors will open on an in-phase reversal equal to 20 per cent of its rating. By referring to the curve it will be found that when the network relay trips on a minimum in-phase reversal equal to 20 per cent of the protector rating with shunt reactors it will just close its tripping contacts on an in-phase reversal of 16.4 amp. without shunt reactors. Therefore the relay can be set in the laboratory to trip on a minimum in-phase reverse current of 16.4 amp. without shunt reactors, and when it is placed on the protector it will operate to open the protector on a minimum in-phase reversal of 240 amp., or 20 per cent of the protector rating. Thus the calibration curve makes it possible to set the network protector to trip on a definite value of high reverse current without having to have a test set-up capable of handling a large value of current.

It will be noted that with the shunt-reactor scheme the desired results are obtained without connecting any contacts in series with the tripping contacts of the network relay. Also the protector operates with maximum sensitivity under all primary fault conditions. Another important feature of this scheme is that should the cut-outs fail to function or the reactors become open-circuited, the network protector will still trip should a primary fault occur. From this it can be seen that a high reverse-current setting has been obtained for the network protector without sacrificing its reliability of operation. The scheme can also readily be converted into a sensitive scheme of control merely by open-circuiting the shunt reactors, if it is found at any time that conditions on the network system have changed so that a high reverse-current setting is no longer required.

Phasing relay used with high reverse-current settings

When using high reverse-current setting the type CNA phasing relay will usually be required in conjunction with the type CN-3 relay to perform the closing function. The phasing relay has been omitted from the diagram in Fig. 1 for clearness, as it would be connected in the usual manner if used. The use of the phasing relay will depend upon the magnitude of the insensitive setting and the voltage of the primary feeder with which the network protector is associated. If the voltage of the feeder is relatively low, such as 4,000 volts, so that the charging current of the feeder is less than the magnetizing current of the transformers connected to it, or if the type CN-3 relay is given such a high reverse-current setting that the protector will not trip when the station breaker is opened, the type CNA relay may be omitted. For applications where one or both of these conditions do not exist it is advisable to use the phasing relay.

Network protectors equipped with this shunt-reactor scheme have been operating satisfactorily on a number of network systems for some time. The shunt-reactor, cut-out, current-transformer units can be added to the standard type CM-1 and CM-2 network protectors so as to render them insensitive if desired with very little labor or expense.

Care must be exercised in using high reverse-current settings on network protectors, and the settings used should be only just high enough to prevent the too frequent operation of the protectors. If only a few protectors associated with each primary feeder are given a high reverse-current setting, when the station breaker on a primary feeder is opened those protectors having sensitive settings will trip; then all of the charging current of the feeder and the magnetizing current of all the transformers connected to the feeder will flow from the network through the few protectors having the high settings, thus causing them to open and completely disconnect the feeder from the system. Obviously, if too many protectors are given high settings, there will not be enough current through each of them to cause them to trip and the feeder will not be disconnected from the network.

The use of high reverse-current settings on too many protectors and the use of settings which are too high on even a few protectors not only prevents disconnecting a feeder when the station breaker is tripped manually but may also prevent clearing the feeder from the network when a ground fault occurs on the feeder. With the usual network transformer connections—that is, high-voltage delta and low-voltage star—when a ground fault occurs on the feeder there will be no zero phase-sequence current flowing through the network protectors. There may be, however, enough positive and negative phase-sequence current flowing from the network to the feeder to operate the network relays before the feeder breaker at the station opens. However, if the feeder breaker clears the faulty circuit from the station end before the network protectors clear it from the network end, the network relays must then function on the charging current of the grounded feeder and the magnetizing current of the transformers connected to it in order to isolate completely the faulty circuit from the system.

No Time for Complacency

"IF THE light and power companies are to remain an agency for constructive achievement they cannot rest complacently on past performance. They must realize they are no longer living in the years during and following the World War, when the great problem was to finance additions to carry the loads available practically without solicitation. They must appreciate that the task now confronting them is intelligently to bring about greater diversification in the distribution of their product—electricity—so as to improve investment efficiency and more surely safeguard the billions of dollars already spent, and yet to be spent, for generating capacity, distributing and other facilities."

MARSHALL E. SAMPSELL.

READERS' FORUM

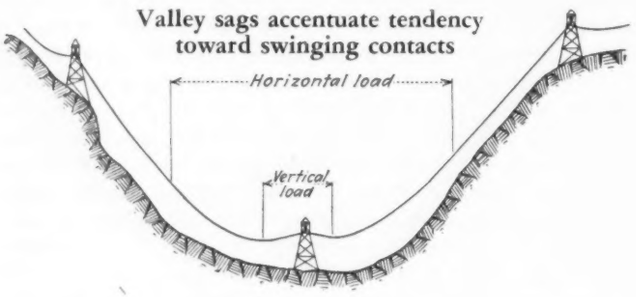
Line Profile May Account for Tennessee Sunrise Interruptions

To the Editor of the ELECTRICAL WORLD:

We believe that there is a very probable explanation regarding the electrical outages encountered by the Tennessee Electric Power Company, which outages occurred when there were no electrical disturbances and at or about sunrise, as reported in the October 10 issue.

Towers located in valleys where a large portion of the vertical weight of the wire is supported on the adjacent towers and not on the tower in the valley will often cause trouble in the early morning. At night the wires will draw taut, and if suspended on suspension insulators they will swing upward and draw up close to the underside of the crossarm, or the wires will swing out or in, depending upon angles in the line at this tower.

When the sun comes above the horizon in the morning and strikes the top conductor it expands and the insulators will assume the normal position, while the lower wires may still be drawn taut. Contact of conductors



Valley sags accentuate tendency toward swinging contacts

will then result unless there is very large separation between conductors.

This is a common trouble encountered when transmission lines are not properly located to prevent uplift on the wires. A cold templet should be applied to the profile as well as a hot templet when spotting tower location. A cold templet is one made to indicate the position of the wire when subjected to the lowest temperature. A hot templet is one which indicates the position of the wire when subjected to the highest temperature. The cold templet will indicate uplift tendencies on conductors and insulators.

Even if uplift tendencies are not encountered the vertical loading may be reduced so much that light breezes will bring these conductors together.

Calculations should be made for all towers located in valleys to determine the least vertical weight on insulators compared with the horizontal wind load and also angle components of wire load. Wind load should be applied upon a length of wire equal to one-half the adjacent span length. The vertical loading will be the weight of the wire between the adjacent low points of sag in adjacent spans. This latter length of wire may be very small if a tower is located in a valley. This calculation will often indicate that normal wind loads will produce excessive swing of conductors.

The troubles enumerated seem to indicate that they are due to the above causes, which can be eliminated by proper design of the line. Towers located in valleys have to be increased in height and often have their locations changed in order to keep the vertical loads as great as possible compared with the horizontal loading.

McClintic-Marshall Corporation,
Bethlehem, Pa.

H. O. HILL,
Assistant Chief Engineer.

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BOOK REVIEWS

The Nature of a Gas

By Leonard B. Loeb. John Wiley & Sons, 440 Fourth Avenue, New York. 153 pages. Price $2.50.

The National Research Council's committee on electrical insulation has sponsored this monograph by Professor Loeb. It is intended to interpret to those struggling with the dielectric problems of the electrical industry the current beliefs about the electron and its participation in the structural make-up of atoms and molecules. The mathematical presentation is simple, the author having chosen to give a word picture of the fundamentals of gases, their behavior under ionization and the phenomena of electron emission. Essentially the book presents the physicist's approach to the dielectric performance of gases.

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Structural Steel Report

American Bureau of Welding. Published by American Welding Society, 33 West 39th Street, New York, N. Y. 208 pages, 54 illustrations, 18 tables. Price $1.

The report presents the results of a five-year investigation which involved the testing of nearly 2,500 specimens of arc and gas welded joints. The principal objects of the research were the determinations of: (1) Safe design values under static loading for various types of fusion welded joints as commercially welded in structural steel fabricating shops. (2) The degree of uniformity of the strength of welded joints that may be expected from such shops throughout the country.

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Methods of Test Relating to Electrical Insulating Materials

Publication of American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa. 212 pages, illustrated. Price, $1.25.

All the adopted standards and tentative standards for tests of insulation materials have been compiled in one book. Porcelain, molded materials, oils, varnishes, compounds, paper, cloth, cotton and silk yarns, laminated materials are covered in this authoritative publication. There are other specifications for tests of such fabricated products as tapes, rubber gloves and rubber matting.

Electrical manufacturers, consultants and laboratory technicians will find the book indispensable. Many laboratory experiments will suggest themselves to technical teachers who yearn for ways and means of departing from stereotyped courses of exercises in machine and circuit testing in their student laboratories.

Men of the Industry

F. P. Cummings Resigns from Commonwealth & Southern

F. P. CUMMINGS has resigned as a director and vice-president of the Commonwealth & Southern Corporation. Mr. Cummings had extensive engineering experience in the West and South before undertaking executive duties with Eastern holding companies—the Southeastern Power & Light Company in 1926 and Commonwealth & Southern three years later. His early connections included Denver Gas & Electric Company, Montgomery (Ala.) Light & Water Power Company, Empire District Electric Company, Joplin, Mo., and the Alabama Power Company.

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HUGO W. ROHDE has been elected secretary of the Engineers' Society of Milwaukee.

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A. W. MANBY, who was chief operator at the Queenston generating station of the Hydro-Electric Power Commission of Ontario, Niagara Falls, has been transferred to its now Chats Falls plant, Fitzroy Harbour, Ont.

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H. P. CURRIN of Eugene has been appointed electrical engineer of the State Board of Engineering Examiners of Oregon, succeeding Fred W. Weber of Portland.

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F. W. RALSTON, for 36 years a street and interior lighting specialist of the General Electric Company, with headquarters at Lynn, Mass., has left that organization to become president of the Ralston-Weber Glass Company, Charlestown, Mass. The new organization will manufacture stained glass and electrical fixtures and handle commercial illuminating engineering work.

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FRASER JEFFREY, electrical engineer for the Allis-Chalmers Manufacturing Company, has been elected vice-president of the Engineers' Society of Milwaukee. Mr. Jeffrey received his technical education in electrical engineering in the Toronto Technical School. He started his career in the electrical industry with the Bullock Electric Company, Norwood, Ohio, first in the shop and then, in 1907, he became connected with the engineering department. The Bullock Electric Company was later absorbed by the Allis-Chalmers organization and since that time he has been engaged in electrical engineering work with Allis-Chalmers in Milwaukee. Mr. Jeffrey has been a member of the Engineers' Society of Milwaukee since 1907 and is a fellow of the American Institute of Electrical Engineers.

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C. M. Brewer Heads Western Companies

C. M. BREWER, formerly vice-president and general manager of the Mountain States Power Company and of the California Oregon Power Company, has been elected president of both these

companies. The office of president has been held by John J. O'Brien, who as president of Byllesby Engineering & Management Corporation and Standard Gas & Electric Company has served also as president of most of the subsidiary and affiliated companies comprising the Standard Gas & Electric Company system.

Announcement also was made of the election of M. D. Field as vice-president and treasurer, J. C. Boyle as vice-president in charge of operation and Glenn L. Jackson as vice-president in charge of sales of the California Oregon Power Company and of W. L. Fitzpatrick vice-president and treasurer and Z. E. Merrill vice-president in charge of operation of the Mountain States Power Company.

Mr. Brewer is a graduate of the University of Michigan. After having been associated with the Commonwealth Power Company at Jackson, Mich., and the Grand Rapids Muskegon Power Company, he joined the Byllesby organization in 1909 as sales manager of the Muskogee Gas & Electric Company. In 1910 he was appointed sales manager at Mankato, Minn., for the Northern States Power Company. He was later transferred to Sandpoint, Idaho, where he became operating manager of the Northern Idaho & Montana Power Company, remaining until July, 1912, when he was transferred to Richmond, Calif., as manager of the Western States Gas & Electric Company. In January, 1919, he was elected vice-president and general manager of the Mountain States Power Company at Albany, Ore., and in June, 1929, he was elected to the same office with the California Oregon Power Company and moved to Medford, Ore.

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S. SLOAN COLT has been elected a director of Commonwealth & Southern Corporation.

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JOHN B. GORDON, manager of the Arkansas Power & Light Company in Atkins, has been transferred to Ola in the same capacity and J. B. Skipper, formerly manager at Ola, has assumed the managership at Atkins.

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PERCY J. WILSON, formerly sales manager of the Narragansett Electric Company, Providence, R. I., and previously industrial power engineer for the Lowell (Mass.) Electric Light Company, has resigned to become vice-president and treasurer of the New England branch of Kaslin & Company, Inc., the main offices of which are Syracuse, N. Y. Mr. Wilson's headquarters have been established in Providence. The organization specializes in industrial engineering, including economic investigations, bank finance investigations, plant and business management.

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JOSEPH A. STAPLES, JR., has been appointed assistant secretary and treasurer of the Oklahoma and Kansas properties for the Empire Public Service Company, which operates the Oklahoma Utilities Company, Southwest Production Company, Southwest Pipe Line Company and Caney Electric Company. Mr. Staples is a native of Richmond, Va., and goes to Oklahoma from the Virginia and North Carolina properties of the Empire Public Service Company, where he was auditor for this corporation. Prior to his connection with the Empire Public Service Company Mr. Staples was associated with

the accounting division of the State Corporation Commission of Virginia. He is a graduate of Virginia Polytechnic Institute and is a certified public accountant.

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HOWARD EHRLICH of the Electric Trade Publishing Company has been elected president of the central division of the Electrical Credit Association.

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GEORGE G. POST, chief electrical engineer and vice-president of the Milwaukee Electric Railway & Light Company, has been elected a director of the Engineers' Society of Milwaukee.

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W. M. YOUNG of the department of electrical engineering, University of Iowa, Iowa City, Iowa, has joined the engineering research department of the Taylor Instrument Company, Rochester, N. Y.

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A. G. ENNIS, who was engineering assistant in the mechanical department of the Philadelphia & Reading Coal & Iron Company, is now identified with the George Washington University, Washington, D. C., in the capacity of instructor in the electrical engineering department.

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J. C. VAN HORN of Philadelphia has been elected a vice-president of R.C.A. Institutes, Inc., in charge of the four resident schools at New York, Chicago, Philadelphia and Boston. Mr. Van Horn has a service in radio extending over a period of 22 years. His connection with instruction activities started in 1911, when the Philadelphia School of Wireless was formed. This school became a unit of the R.C.A. Institutes two years ago. Mr. Van Horn served for four years as chairman of the Philadelphia chapter of the Institute of Radio Engineers. He is a member of the American Institute of Electrical Engineers.

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F. X. MONVILLE, superintendent of buiding operations of the Philadelphia Electric Company, was the guest of honor at a dinner held November 18 at the Bellevue-Stratford Hotel, the occasion marking his twenty-fifth year as an employee of the Philadelphia company. Among those present were William H. Taylor, president; H. P. Liversidge, A. B. Huey, H. B. Bryans and G. E. Whitwell, vice-presidents; H. C. Lucas, treasurer; A. V. R. Coe, secretary; J. M. Bennett, manager of public relations; A. M. Boyd, manager of personnel; W. H. Wade, president Pennsylvania Electric Association; J. H. Shearer, president Penn Central Light & Power Company; John S. Wise, Jr., president Pennsylvania Power & Light Company; W. E. Long, vice-president United Gas Improvement Company. Mr. Monville was born and educated in Philadelphia, graduating from the University of Pennsylvania in 1906. He entered the employ of the Philadelphia Electric Company as a wireman November 14, 1906. A year later he was made superintendent of the main building and at the present time is in charge of the building and maintenance operation of the numerous office buildings of the company.

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OBITUARY

Herbert B. Flowers

HERBERT B. FLOWERS, whose death was announced in the November 28 issue of the ELECTRICAL WORLD, was both a

lawyer and an engineer, having completed his law course in 1903 at the University of Michigan and his engineering course in 1905 at the same institution. His early experience in the public utility industry was obtained with the Detroit United Railways, where he spent seven years in the electrical and transportation departments.

In 1913 he became assistant superintendent of transportation for the United Railways & Electric Company, Baltimore, four years later being appointed assistant general manager. In 1919 he was advanced to the position of general manager, and subsequently was named vice-president and general manager. It was from this executive position that he resigned in 1923 to assume the presidency of New Orleans Public Service, Inc. In the summer of 1930 Mr. Flowers left New Orleans and, transferring his interests to the East, he engaged in engineering work in New York. He was active in the National Electric Light Association and in the American Electric Railway Association.

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STEWART MORRIS, hydro-electrical engineer, died, of heart disease, at his home in Jackson Heights, Long Island, November 20. At the time of his death Mr. Morris was connected with Guggenheim Brothers. A native of Covington, Ky., he received his early education in his native city and was graduated from the University of Kentucky in mechanical engineering. In the course of his career he had visited hydro-electric properties in Hobart, Tasmania; South Africa, Mexico and in most of the Western states of the United States. Mr. Morris was 49 years of age.

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JAMES H. CALDWELL, engineer and banker, died at his home in Troy, N. Y., November 18 in his sixty-sixth year. Mr. Caldwell was identified with the electrical industry in New Orleans before removing to Troy. A native of Mobile, Ala., he was graduated from the Rensselaer Polytechnic Institute in 1886. He had engaged in engineering enterprises in various parts of the country and at the time of his death was chairman of the board of the Ludlow Valve Manufacturing Company. Mr. Caldwell was vice-president and a trustee of the Rensselaer Polytechnic Institute.

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DR. KENNETH G. MATHESON, president of Drexel Institute since 1922 and of the Georgia School of Technology for seventeen years previously, died, of heart disease, at his home in Bryn Mawr November 29, in his sixty-eighth year. Dr. Matheson was born in Cheraw and received his education at Leland Stanford University, the University of Chicago and Columbia University. He was made the recipient of honorary degrees by Washington and Lee University and the University of Pennsylvania. His success as an educator while occupying the presidency of Georgia "Tech" led to his appointment to the presidency of Drexel Institute. His chief contribution in the educational field in recent years was the extension of the co-operative scheme of education whereby leading manufacturing establishments and public utilities in Philadelphia and vicinity are co-operating with Drexel Institute in special five-year engineering and business administration courses. Last year Dr. Matheson was president of the Association of Co-operative Colleges, which is now the division of co-operative engineering of the Society for the Promotion of Engineering Education, and at the time of his death he was a member of the education committee of the Philadelphia Chamber of Commerce.

Financial and Statistical News

UTILITY common stock averages slid off 3.68 per cent during November in comparison with a drop of 10.76 for rails and 10.63 per cent for industrials, Dow-Jones figures show. The ELECTRICAL WORLD average of 37 representative utility stocks declined 2.1 points since the beginning of November to 42.7. Movements this week have been exceedingly erratic; although major news items have been absent, fluctuations have been wide.

——FIXED INCOME SECURITIES, ALTHOUGH DOING LITTLE MORE than holding their own, should begin to be affected by certain favorable factors. The drain of gold from the United States has not only ceased but there is a slight reverse movement. The hoarding of currency, as reflected in steady increases in circulation, has apparently ceased, and currency in circulation, contrary to the seasonal trend, has shown a decreasing trend. Sentiment, moreover, gradually improves with the decrease in bank and other failures.

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New York Utility Bonds Added to Legal List

NEW YORK STATE Banking Department has announced that New York State Gas & Electric Corporation first 5½s, due in 1962, had been added to the list of securities that are legal for investment by savings banks and trust funds in the State of New York. Indiana & Michigan Electric Company first 5s, due in 1957, and the first and refunding 5s, due in 1955, have been dropped because of the ratio of debt to capital stock. West Penn Power Company first 5½s, due in 1953, series F, have been eliminated because of redemption notices.

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Pacific Gas & Electric to Redeem Feather River Stock

ANNOUNCEMENT HAS BEEN MADE that the Pacific Gas & Electric Company has arranged for the redemption on December 31, at par and accrued dividends, of all of the outstanding class A 7 per cent preferred stock of the Feather River Power Company. This stock represents the only issue of the Feather River Power Company of which any portion is now held by the public. Upward of two-thirds of the total issue has already been acquired by the Pacific Gas & Electric Company.

All of the class B preferred stock and the common stock of the Feather River company are owned by the Great Western Power Company of California, which is also controlled by the Pacific company. The retirement of the remaining balance of the Feather River stock marks a further step in the Pacific company's program for consolidating with its own system the properties of which control was acquired from the North American Company in 1930.

Holiday Reduces Output

ELECTRIC LIGHT and power plant output for the week ended November 28 fell off somewhat compared with that of other recent weeks because of the Thanksgiving holiday, but maintained approximately the previous standing relative to corresponding periods in 1930. During the first three weeks in November it was down successively by 5.8, 5.2 and 3.9 per cent. Last week it fell short of the output in Thanksgiving week of 1930 by 4.3 per cent.

According to the National Electric Light Association the energy production in recent weeks, with corresponding production in other years, was as follows:

Week Ended	1931	1930	1929	1928
October 24.....	1,647	1,747	1,824	1,678
October 31.....	1,652	1,741	1,816	1,688
November 7...	1,628	1,728	1,798	1,697
November 14...	1,623	1,713	1,794	1,696
November 21...	1,655	1,722	1,818	1,701
November 28...	1,600	1,672	1,718	1,619

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Bankers Urge Utilities to Clarify Issued Reports

WHILE expressing full confidence in existing policies and management of the power and light industry, the public service securities committee of the Investment Bankers' Association in its recently issued report made the following suggestions:

First—It will surely help security values if the threat of municipalization of the industry can be removed. The magnitude of this threat depends upon the extent to which public sentiment is against or for private ownership and operation. Whether it is the one or the other is for the public ultimately to decide, for it is a matter of public policy—not one of right or wrong, but only of which method, all things considered, will give the greatest general satisfaction. The opposition to private operation is chiefly from a radical element, but in time the public will follow anywhere, unless it is actively satisfied with conditions as they are. If the public mind changes from its present belief that the electric light and power business should be a regulated private business, as the radicals are exerting themselves to make it, security values will be sorely disturbed.

Legislatures and the public are like most of the rest of us. To assume they are incapable of comprehension is to make a great mistake. If they do not understand, whose fault is it? Or, do they perhaps understand too much? They resent the complications of accounting statements and balance sheets, the use of technical language that is hard even for the initiated to understand, the bald statements unsupported by convincing detail. For some strange reason the public feels that the statements by public officials about publicly administered operations are worthy of credence, whereas they are often completely misleading and based on methods and practices that would bring up private operators with a round turn.

We urge the operating managements themselves, by the voluntary correction of their own mistakes, by methods frank and fearless, by the open discussion of controversial questions, by simply illuminating a technically difficult subject, to create the favorable public opinion that will itself, in its own interest, dictate to legislative halls. Public policies as expressed by groups or organizations fall short of winning the public confidence. What is needed are direct statements of managements themselves in connection with the essential problems of their own situation. There is no danger that in the end the common principles back of the business and the common needs will not by such approach automatically come through to the surface, and will be understood and appreciated for what they are worth. Service must be put above profit.

Second—This is a business conducted under public franchise, and entitled therefore to only a fair return on a fair value of its property used in the public service. If, however, its profits are limited, they

must be assured, so far as regulatory sanction can accomplish this, but they must be adequate to compensate for the many uncertainties and risks involved in the business. The unavoidable corollary of this proposition is that the business, as it emerges from its pioneering days into increasingly standardized practices, is not a legitimate subject for purely speculative operations. There are large legitimate profits justly to be made by those who contribute constructive ability and capital and take the inevitable risks of expanding a service based on a technical art that is only not static, but is constantly and rapidly undergoing an evolutionary process, the end of which no man can foresee. But mere corporate manipulation of securities for speculative purposes cannot be tolerated in this business. It takes but a few such operations to stigmatize the legitimate efforts of the many.

Simplicity suggests strength

Third—Simplicity is the essence of strength—both in corporate and financial structures. It is a defensive sword that is double-edged. On the one hand, the securities produced under simple plans are of simpler forms and classifications and are, therefore, in general not only more readily sold and command better prices, but tend also to be more stable, because the directness of relationships to the tangible property, on which their respective worths must ultimately be based, is more easy to trace. On the other hand, the elimination of complication of corporate and financial structures tends to dissolve the fears and mistrusts of the public and of legislatures.

The principles of simplicity should, above all, be applied to holding companies. It is unjust to the holding company that it should be discredited by absurdities of corporate and financial involvment, and pyramiding, to which it occasionally has either deliberately or thoughtlessly been subjected. It is grotesquely unnecessary that sometimes six, seven, even eight corporate entities should continue to exist piled one on top of another till responsibility is well-nigh lost in the confusion, however logical each may have been individually at the time of its creation. The different levels of securities that the public is asked to buy, the impossibility in not a few instances of following their relative liens or obligations, the practical impossibility of pursuing some of them to ultimate account and settlement, result in a market uncertainty about them and a public criticism of them that has been but too apparent and that has done much to prejudice underlying worth. The strength and stability of the utility security markets depend in no small degree on simplicity of corporate and financial structures—not as a hope but as a fact. Conspicuous holding companies are now simple or are in process of becoming so, while unfortunately others are apparently oblivious of the need.

Fourth—So nearly as possible, a stabilized basis of property valuation should be developed. This is easier said than done, but candid effort can surely remove some of the chief causes of instabilities that are dependent on variations in commodity price levels and in varying rates of depreciation and obsolescence. Present deflation of values but emphasizes the disturbing effect of too fluctuating bases of value. To arrive at what is fair will call for mutual concessions—from public regulatory bodies, of preconceived notions that often have reflected political expediency rather than economic and basic considerations; from private ownership, of other preconceived ideas of the rights of private property in a regulated business imbued with a public responsibility and trust. Preconceived notions need to be reappraised or set aside in favor of the answer to be found only after an unbiased solution that will more nearly represent public and private rights than any yet applied. This committee cannot but believe that a sound economic solution will sooner or later receive judicial sanction.

One evil of the lack of stability of valuations was that the periods of rising commodity prices lead, in instances, to an excess of capitalization, particularly of holding companies. Those who were far sighted saw this growing tendency. It was greatly stimulated during the period of inflation that culminated in the crash of the later part of 1929. It is, therefore, perhaps not surprising that in such a period of abnormal deflation as we are passing through it has been found necessary in instances to make some capital readjustments, to conform with a new set of specifications.

Fifth—Strengthen the state regulatory commissions before resort is had to the regulation of holding companies. Despite the arguments that have been made to the contrary by careful thinkers, and though there are conceded abuses of this useful and essential device, this committee continues to believe that regulation of the holding company is not the first method to be sought in applying the remedy.

It has been argued that the holding company interferences with direct management are beyond the powers of regulatory commissions to control. This we do not believe. It is not in the multiplication of agencies that relief is to be sought so much as in the rectifying of defects in existing agencies. Herein the application of the principles of simplicity is again sound. If a commission has not necessary authority to regulate adequately, give it authority; equip it with funds, personnel power, and many apparent needs for substructure regulation will disappear. To invoke superstructure regulation is to confuse rather than simplify the issue. The blue sky laws can always be invoked against improper issues. In instances, the clearly implied powers of commissions can be invoked to produce the desired results.

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New England Power Acquires Assets of Vermont Utility

FOLLOWING ORDERS ISSUED by the Public Service Commission and effective as of November 1, the New England Power Corporation of Vermont has acquired the Vermont assets of the Fall Mountain Electric Company. Heretofore the Fall Mountain company, dealing directly with local customers, has handled the business of the New England Power Association at Bellows Falls, Vt. The change is substantially in name only, there being no change in service or personnel. The New England Power Association is following organization plans to conform with state lines with the ultimate view of having all companies in Vermont and New Hampshire under two separate corporations.

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Financing in November Continued Light

PUBLIC OFFERINGS of electric light and power securities totaled only $26,484,000 during the month of November, as compared with $74,100,000 in November, 1930. The downward trend which set in in the spring continues, and although a slight recovery occurred in November, as compared with October, when the utility companies did not enter the market at all, the total is still meager. Five companies contributed to this limited sum.

The accompanying table shows that the feature of utility financing in recent weeks has been the issuance of rights.

New Security Issues of Electric Service Companies in November

Name of Company	Amount of Issue (Par Value)	Period (Years)	Class	Purpose	Interest Rate	Price	Per Cent Yield
Chicago District Electric Generating Co.	$2,250,000	30	First mortgage bonds, series B	To provide funds for construction purposes	6	93½	6.50
Southwestern Gas & Electric Co.	2,300,000	30	First mortgage gold bonds, series C	To reimburse treasury for cost of additions to its property	6	91	6.70
Ohio Public Service Co.	3,434,000	30	First and refunding gold bonds, series E	Additions and betterments, to retire underlying divisional bonds and for other purposes	5½	93	6.00
Public Service Co. of Colorado	11,000,000	30	First mortgage and refunding bonds, series C	To refund bonds and to reduce short term indebtedness	6	91	6.70
North Boston Lighting Properties	7,500,000	1	Secured gold notes	To retire maturing notes and reduce bank indebtedness	5½	100	5.50
Total	$26,484,000			Rights		$47,073,000	
Total amount actually realized	24,900,370			Total financing		$71,973,370	

NEW CAPITAL ISSUES

First mortgage gold bonds of the Kansas City Power & Light Company, 4½ per cent series, due 1961, were issued during the week ended December 3, a piece of financing involving a total of $3,000,000. Proceeds of these bonds will be used to reimburse the company for funds heretofore expended for additions to property, and for other corporate purposes. The mortgage under which the bonds are to be issued is a direct first lien on all fixed property of the company.

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Central Maine Power Company made an offering of first and general mortgage gold bonds, series F, to the amount of $1,500,000, the price being 99 and interest, yielding about 5.57 per cent. These bonds, dated December 1, 1931, mature December 1, 1961.

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Super-Power Company of Illinois issued first mortgage 6 per cent gold bonds, series of 1931, at 91 and interest, yielding about 6.70 per cent. This offering totaled $2,500,000. Proceeds from the sale of these bonds will be used in part payment of the cost of additional generating transmission lines and other facilities.

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NEWS BRIEFS

Central States Edison Company has never omitted or reduced a dividend. In the November 28 issue of the ELECTRICAL WORLD this company was reported to have reduced the dividend on the 7 per cent cumulative preferred stock. The information, obtained from what was considered a reliable source, was erroneous.

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A total of $132,000 principal amount of Siemens & Halske and Siemens-Schuckertwerke 7 per cent secured bonds, due in 1935, have been drawn for redemption January 1, 1932, at 102 and interest.

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Directors of Stone & Webster, Inc., have voted to change quarterly dividend payment dates to February 15 from January 15 and to postpone consideration of the dividend now due until January. During the year 1931 the corporation has paid dividends aggregating $2, not including the dividend of $1 paid January 15, 1931, which was declared in the preceding November and applicable to the 1930 period.

Report of Great Consolidated Electric Power Company, Ltd., of Japan (Daido), just received shows net income for the six months ended May 31, 1931, before depreciation, interest and amortization of discount, equivalent (at the conversion rate of 49 cents per yen) to $4,927,678, as compared with $4,728,347 for the similar period in the year 1930.

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Holder of 28 Shares Sues Insull Company

"I DECIDED to form an investment company to buy and hold securities generally, but more particularly to buy and hold the securities of the several companies with which my name is associated." This is part of a public statement made by Samuel Insull shortly after the formation of Insull Utility Investments, Inc. The statement further points out that the charter rights of the company are "to acquire, dispose of, underwrite and deal in securities and to do a general investment business."

These quotations from his father's statements were made by Samuel Insull, Jr., in commenting upon a suit filed November 27 in the Superior Court of Cook County, Illinois, by Allen Hoban, attorney representing Fred C. Griesel, a minority stockholder of the corporation. The suit asked for an injunction to prevent the paying of dividends by the corporation and asked the appointment of a receiver. The complete statement of Mr. Insull, Jr., follows: "The record of the company indicates that Fred C. Griesel is the owner of 28 shares of the common stock of Insull Utility Investments, Inc., which was purchased in the open market. Allen E. Hoban, his attorney, is said to be his brother-in-law.

The bill seems to criticise certain actions as not in conformity with the stated investment policy of the company and the purpose for which it was formed. The actions so criticised are in line with the policy which was stated at the time the company was formed, and has since been repeated in annual reports and similar documents whenever the occasion has presented itself.

Any securities may be held

"The company never has claimed that its investments were entirely confined to the securities of any specific companies. On the contrary, annual reports, advertisements and all other representations made to the public have clearly stated that the company has authority to invest in any securities thought to be desirable. The schedules of the portfolio of the company and statements made in the annual reports have shown that although its investments were mainly in certain securities referred to, they were in no sense limited to such securities.

"For example, the annual report for 1929, the first year of the company's operation (which was sent to all stockholders) said:

Approximately 71 per cent of the securities held are listed on the Chicago or New York Stock Exchange or on the New York Curb, and 88.6 per cent of them are securities of the following companies: Central and Southwest Utilities Company, Commonwealth Edison Company, Middle West Utilities Company, Midland United Company, the People's Gas Light & Coke Company and Public Service Company of Northern Illinois.

"The annual report for 1930 (also sent to all stockholders) said:

Approximately 92.7 per cent of the securities held by the company are listed on the Chicago or New York stock exchanges or on the New York Curb, and 90.74 per cent of them are securities of the following companies: Central and Southwest Utilities Company, Commonwealth Edison Company, Middle West Utilities Company, Midland United Company and subsidiaries, the People's Gas Light & Coke Company, Public Service Company of Northern Illinois and Corporation Securities Company of Chicago.

"To this report was appended a statement showing the cost of the securities owned and their then market value.

"The bill also questions the propriety of the company paying dividends. An examination of the earnings statement and surplus account of the company, as certified to by independent auditors, shows ample justification for the payment of all dividends by the company during the current year.

"It is unfortunate that a suit of this character should get public attention at this time.

"Financial opinion, according to newspaper expression in Chicago, does not take this suit seriously. It is patently an affair whose whole purpose is not apparent from the court petition. The interest represented in the suit is one-thousandth of 1 per cent of the corporation capitalization. According to royal F. Munger, financial editor of the Chicago *Daily News*, the place for such action is in a stockholders' meeting and not in the courts. To bring it into court, with the attendant attraction of publicity, argues an intent beyond the petition itself."

After hearing the petition the court decided against appointing a receiver and also denied application for an injunction against payment of the quarterly dividend. Counsel for the plaintiff then withdrew the petition.

Business News and Markets

Changes in Freight Rates

By E. E. CONDON
Traffic Counselor, Chicago, Ill.

MANUFACTURERS of electrical equipment and devices of all kinds find themselves confronted beginning December 3, 1931, with a new class freight rate structure in both "official" and Western classification territory. The revision is the result of a recent investigation of the Interstate Commerce Commission and the decision will effect both increases and decreases. In general, the first four classes in "official" territory will be increased while the lower classes will be decreased. In the Western territory class rates will be increased. However, there will be many exceptions caused by the newly provided distance scales.

Shipments of electrical goods are provided with various classification ratings for both carload and less-than-carload lots because of the difference in transportation characteristics of the numerous commodities shipped by the electrical industry. The classification ratings provided for the various electrical goods will not be changed by the revision. Many exceptions to the classification ratings provided for electrical goods are in effect, and they will not be canceled by this adjustment. However, it is important for all shippers to keep in constant touch with the classification basis provided for their shipments. Because of the rapid progress and expansion of the electrical industry, the ratings provided for many commodities have been and will continue to be changed. It has been necessary to provide specific descriptions for many of the recent new electrical appliances. It is important for shippers to protect themselves against overcharges caused by the application of the improper classification basis used by the carriers when submitting freight bills. Many items for which no specific rating is provided are classified by the general rule of analogy, and in some cases the commodity should have a specific rather than a general classification description.

It is the duty of all shippers to analyze the reasonableness of the ratings provided for their shipments so as to protect their interests and to keep their transportation costs on the correct basis. Many advantageous changes have been made in ratings provided for electrical goods through the efforts of the traffic executives of the industry, and it is hoped that continued progress in this direction will be realized through the co-operation and interest of all shippers in the industry.

In compliance with the order of the commission the carriers have published tariffs quoting the new rates which will be effective December 3. These tariffs have been forwarded to all shippers whose names appear on the carriers' mailing lists. Shippers who have not as yet received copies of the new tariffs, and especially those who ship in large volume, should apply to the carriers for the tariffs that apply between the points of interest to them. It is important to check carefully all freight bills before payment after December 3 to avoid the possibility of overcharges that may exist because of the failure of the carriers to submit all freight bills based on the new set of rates.

The governing principle of the adjustment is the so-called "mileage scale." In the past many class rates were based on "grouping points" in which the question of mileage was an important factor, but not always controlling in the construction of class rates. In the past few years the tendency of the Interstate Commerce Commission has been to give the question of mileage greater consideration as a factor of rate construction. Prior to this adjustment the various class rate scales lacked uniformity in basic rate-making principles and in some cases were inconsistent. However, it would be impracticable for the carriers to establish the same scale of rates in all rate-making territories because of the difference in operating conditions and also because of the difference in the cost of the service rendered.

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McGraw Award for Co-operation Goes to Thaddeus R. Beal

THE judges appointed from among the directors of the Society for Electrical Development have awarded the James H. McGraw medal for co-operation to Thaddeus R. Beal, president of the Central Hudson Gas & Electric Company. This is in recognition of his constructive contribution to the advancement of co-operation in the electrical industry by the development of a balanced system of market promotion and service in the Hudson River Valley in which the participation of the contractor, dealer, wholesaler and power company has been co-ordinated to their mutual advantage and to the public benefit.

The presentation was made December 3 at a dinner meeting held in Poughkeepsie, and sponsored by the Hudson Valley Electrical League. The committee of judges which awarded the medal to Mr. Beal consisted of D. C. Birdsell, B. W. Clark, L. W. Davis, C. L. Edgar and S. L. Nicholson.

In 1925 this medal and purse were awarded to J. Robert Crouse, in 1927 to W. Winans Freeman, in 1928 to Henry H. Courtright and in 1930 a posthumous award to Charles T. Hutchinson. In 1929 no medal for co-operation was given.

The citation made in connection with the award follows in part:

Thaddeus R. Beal, president of the Central Hudson Gas & Electric Company, Poughkeepsie, serving some 82 communities of the Hudson River Valley, has seen as vital to this public service the development of a broad system of supply that will bring conveniently accessible to the homes and industries of this section not only electric light and power but satisfactory facilities for acquiring the equipment, appliances and accessories necessary for the use and enjoyment of electricity in all its applications. He, therefore, set about the co-ordination of the various agencies concerned, including electrical contractors, dealers, wholesalers and manufacturers, and those department, hardware, drug and specialty stores and mail order houses engaged in the merchandising of domestic electric appliances, for the establishment of standards of quality and service that would advance the progress of the electrical business in the public interest.

Under this plan general promotion is carried on by the power company; sales, installation and service by the dealers; distribution of products by the wholesaler, and the development of

equipment by the manufacturer. Also, there has been organized a balanced program embracing analysis of the market, dissemination of information, education of personnel, co-operative advertising, installment financing, consulting service to the trade, advisory service to customers and the supervision of co-operative activities that has achieved great improvement in harmony of policy and purpose within the electrical industry and in the service which the industry is rendering to the public.

Believing that this demonstration of the practical efficiency of a well-organized local co-ordination of all those agencies that together constitute the modern service of electric supply is an outstanding contribution to the advancement of co-operation within the electrical industry, and realizing the extent to which his inspiration and leadership have made this achievement possible, the judges have awarded to Mr. Beal the medal and purse for co-operation for 1931, given under the James H. McGraw award.

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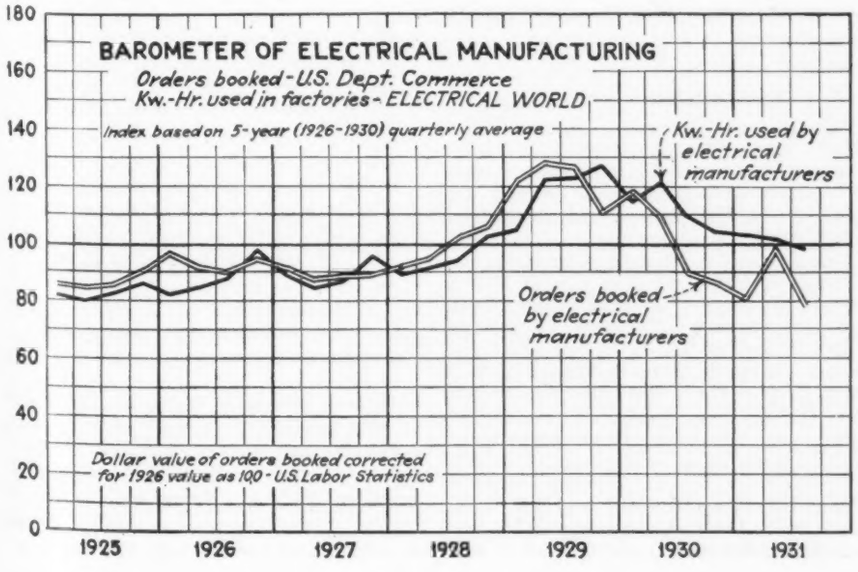
Barometer Shows Inventory Volume

AN INDEX OF ELECTRICAL manufacturing activity is given in this new barometer made up of orders billed and energy used in electrical manufacturing plants. It will be noted that production follows orders with a time delay of about three months. It is also interesting to observe that the barometer affords an index of inventory volume. From the correlation in the past it is seen that manufacturing plants should now be responsive to the second quarter increase in orders billed. These data are based on about 70 per cent industry coverage.



General Electric Promotes Range Campaign

AN ADVERTISING and sales promotion program to gain public acceptance for electric cookery will be launched by General Electric-Hotpoint in January, 1932, according to George A. Hughes, president of the Edison General Electric Appliance Company, Inc.

In size of advertising budget, scope of operations and distribution set-up this program will follow closely the plan of development which, in the past four years, has made the electric refrigerator so successful. For some time it has been increasingly evident, to Mr. Hughes as well as to other well-known executives of the electrical industry, that electric cookery promotion was the next logical step in the development of electric labor-saving devices. The product itself has attained a high degree of perfection; it now remains only to break down popular misconceptions regarding electric cookery, in order to win for electric ranges an even greater success than that which the electric refrigerator has enjoyed. Not only will promotion of electric cookery be of assistance to the trade and the industry in hastening the return of prosperity and putting more men to work but it will provide a huge source of increased load for the lines of utility companies in every part of the United States.

"Aggressive sales promotion and maximum selling activity," said Mr. Hughes, "are far more essential to the growth of the range business than lower energy rates or lower range prices. Nor can the objective of increased range sales be reached if central stations are forced to shoulder, as they have been doing, the entire burden of selling the consumer. A plan of increasing range sales will be successful only when independent distributors and dealers, corresponding to those now doing 75 per cent of the general appliance and refrigerator business, can be attracted to electric range selling.

In practically every section of the country present range sales organizations will be taken over as rapidly as possible by authorized General Electric range distributors, who will develop an increasingly large additional range market. Not only will these distributors undertake the sale of ranges on a retail basis but they will extend to all retail outlets and utilities in their territories more advertising and sales co-operation than ever before. To all this activity will be added the force of the national magazine, radio and general publicity campaign and the local advertising done by distributors, utilities and other retailers.

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New York Metal Prices

	Nov. 25, 1931 Cents Per Pound	Dec. 2, 1931 Cents Per Pound
Copper, electrolytic	6.25–6.50	6.50
Lead, Am. S. & R. price	3.475	3.85
Antimony	6.50	6.35
Nickel, ingot	35	35
Zinc, spots	3.85	3.475
Tin, Straits	22.75	21.25
Aluminum, 99 per cent.	23.30	23.30

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New Impetus Added to Electric Cookery Campaign

FUTHER PROGRESS is reported on the plans for universal public electric cookery acceptance being developed by the range section of N.E.M.A. With the co-operation of virtually all sections of the electrical industry, it is planned to raise $3,600,000 for national advertising to educate the public on the merits of electric cooking. This campaign will lay the foundation for the N.E.M.A. range manufacturers' product advertising, which involves the further expenditure of at least $8,400,000.

Beyond the immediate equipment market, it is estimated that the campaign in three years will create an additional $200,000,000 of business, active and potential. Of this, 40 per cent will comprise the revenue from range sales and the balance from generation and distribution apparatus and wiring supplies.

The electric range committee, Commercial Section, N.E.L.A., at a meeting held November 19 in Chicago assumed sponsorship of the plan.

Market Conditions

EQUIPMENT business is slow in most sections, with industrials especially cautious in making commitments. Pacific Coast building has speeded up to some extent and the heater business has been accelerated by early cold weather.

——RAILWAY ELECTRIFICATION ORDERS ARE AGAIN TO THE FORE in the Eastern district. Substantial orders are being placed. The outlook for large orders from industrial buyers in the near future is considered decidedly favorable.

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PACIFIC COAST

—BUILDING PERMITS IN *San Francisco decreased in volume 10 per cent in November from last year, but increased 15 per cent in number, which is characteristic of present construction conditions along the Pacific Coast.*

—HIGH WINDS AND *unexpected snow have increased stock orders for line construction material and an early cold spell has doubled heater orders, which had been moving slowly with large local stocks.*

One manufacturer reports 6,000 heaters of various sizes sold in a recent brief campaign in the Northwest and another in San Francisco. One agent reports about 25 per cent increase in the usual seasonal calls for electrical control regulation accessories for oil burners in the same section. Attention is largely concentrated on appliances and seasonable specialties. Holiday buying in department stores thawed into a tremendous volume immediately after the Thanksgiving holiday, with cheaper lines and items carrying about 90 per cent of the electrical sales. Although San Francisco's $3,500,000 school bond issue lost by less than a 1 per cent vote, such issues are faring better elsewhere, several $150,000 amounts being reported. Sacramento, Stockton, Portland and Alameda post offices are ready for bidding, while the $500,000 Reno structure is to be figured early in 1932.

Machinery manufacturers report diversity in their outstanding orders, including two substation circuit breakers and miscellaneous station material valued at $7,500 for Honolulu; a lot of Westinghouse small motor parts practically complete, valued at $4,000, for an oil burner firm of San Francisco; rebuilding three Westinghouse 1,000-kva. transformers plus one for Sacramento Valley installation, valued at $10,000, and an $8,500 General Electric printing press drive control for San Francisco.

Buying by lumber mills, allied woodworking plants and pulp and paper mills is reported at absolute minimum with no immediate indications of improvement. Small industrial buying last week was reported negligible, the following sales being announced: 25 motors to small industrials, ranging from 25 hp. down; three 350-hp. machines for a water system in Tacoma; three 40-hp. motors and five 25-kva. transformers for a water system in eastern Washington; switchboard and switching equipment, involving about $4,000, for a Tacoma water system and about 35 machines from 40 hp. down, the majority 15 hp. and under, to miscellaneous industrials; ten motors from 20 hp. down to a dealer in eastern Washington and about $1,000 worth of miscellaneous switchgear to Seattle central stations.

On December 4, the Seattle Board of Public Works opened bids on two street-lighting jobs involving about $30,000 and on December 3 the Puget Sound Navy Yard at Bremerton opened bids for one motor-driven duplex automatic air compressor. Otis Elevator Company, bidding approximately $50,000, submitted the low offer for elevators for the Portland, Ore., federal building, for which Murch Brothers of St. Louis was low for the general contract. Plans for a projected $100,000 plant for the manufacture of food products were announced in Spokane.

CONSTRUCTION PROJECTS

Consolidated Irrigation District, Selma, Calif., applied for permission to use water from San Joaquin River for hydro-electric power development with ultimate output of 148,000 hp., estimated to cost $10,000,000, with transmission system. Pacific Gas & Electric Company, San Francisco, Calif., plans equipment storage and distributing plant at Concord, Calif., to cost $50,000. Treasury Department, Washington, D. C., is having plans prepared for post office buildings at Bend and Oregon City, Ore., to cost $150,000 and $115,000, respectively. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until December 15 for 55 electric drills for Mare Island, Calif., yard, and for twelve such drills for Puget Sound, Wash., yard (Schedule 6984).

SOUTHWEST

—MANUFACTURERS OF *electric refrigerators in the St. Louis district are stepping up their 1932 production schedules about 20 per cent over 1931, it has been learned. This means many additional motors will be purchased. This is the only real bright news in this week's market. No other big orders have gone through during the past seven days, but a confident tone is still noted generally.*

A municipality in western Missouri has placed an order for some motors and pumps in connection with a water works project. Some other towns are considering improvement in addition to their municipal light plant, while a large city in eastern Kansas contemplates a material increase in its generating equipment facilities. However, those are the only prospective orders at present. Utilities and industrial concerns are still very cautious and are shopping around before finally placing orders for new electrical equipment and supplies.

CONSTRUCTION PROJECTS

Shawnee, Okla., contemplates installation of electric-pumping machinery in connection with waterworks improvements to cost $200,000. Gladewater Refining Company, Gladewater, Tex., is considering plans for oil refining plant to cost close to $100,000. Longview Independent School District, Longview, Tex., plans high school with manual training department, to cost $175,000. Tex-York Utilities Corporation, New Orleans, La., affiliated with Courtland Palmer Company, New Orleans, plans extensions and improvements in oil refining plant at Meraux, La., to cost over $600,000.

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SOUTHEAST

—THE OUTSTANDING ACTIVITY *in the Southeast last week was in the industrial field with the business in the Carolinas. A North Carolina textile purchased a 4,000-kw. turbine and motor and control equipment approximating $140,000. A South Carolina textile ordered $25,000 worth of motors and control equipment and there is pending in the same section an order for a 2,000-kw. industrial turbine and some interesting transformer business.*

One of the largest power companies in this territory last week ordered wire and cable aggregating $15,500 and voltage regulators costing in the neighborhood of $4,500. Some other central-station orders were for $2,500 worth of disconnect switches, $2,100 worth of

street-lighting material, $2,000 worth of creosoted pine poles and $2,000 worth of relay equipment. The Georgia Power Company has just completed a four weeks' campaign in which 1,292 radios were sold, this being 129 per cent of the campaign quota.

CONSTRUCTION PROJECTS

Lynchburg, Va., will receive bids until December 10 for an armory and farmers' market building, estimated to cost $140,000. Alexandria, Va., plans high school with manual training department to cost $300,000. Tide Water Power Company, Wilmington, N. C., contemplates extentions in transmission lines at Beaufort, N. C., and vicinity. Construction Service, Veterans' Administration, Washington, D. C., will receive bids until January 5 for buildings and utilities at Petersburg, Fla., including electric distributing system, electric equipment, refrigerating and ice-making plant, etc.

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NEW ENGLAND

—CAUTIOUS BUYING *of electrical equipment is reported in this district with small power equipment occupying the most attention. During the past week motor sales were spotty.*

—ONE MANUFACTURER *noted an even trend in the sales volume, which at this time is considerably below that of last year. On the other hand, one manufacturer reports an increase in sales of small motors due to the placement of several appliance manufacturing company orders.*

General scheduled materials are quiet. Central-station equipment and heavy machinery are receiving scant attention, though one manufacturer records negotiations of a preliminary nature relative to future power extensions. Some specialties, on the other hand, show encouraging gains, among which is noted a further advance in traffic control signals in Boston, with an order recently in effect to carry on a plan involving over $100,000. Electric timepieces continue to maintain a good sales trend. Domestic appliance sales for the past month show a marked decline over that level reported for last year.

CONSTRUCTION PROJECTS

Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until December 8 for circuit breakers, ammeters, voltmeter and two motor-driven air compressor sets for the Portsmouth, N. H., navy yard (Schedule 5961). Boston Port Development Company, Boston, Mass., plans oil storage and distributing plant at Revere, Mass., to cost over $2,000,000. Hygrade Lamp Division of Hygrade-Sylvania Corporation, Salem, Mass., will carry out expansion program at radio tube manufacturing works.

EASTERN

—RAILWAY ELECTRIFICATION *takes the center of interest in a survey of the electrical equipment market in the Eastern district, not only with regard to prospective account but in connection with actual commitments. The outlook grows brighter in that branch of operation and sizable business is in sight.*

—THE INDUSTRIAL TREND *is decidedly upward in several basic lines of trade, notably iron and steel, metal-working, chemical and leather, and this advancement is expected soon to reflect increased orders for motors, controls and other industrial electrical apparatus. Electric equipment manufacturers express faith in the immediate future with announced expansion programs, covering gross investments of several million dollars.*

About 34 manufacturers of electrical and hydraulic equipment submitted bids on the recent call for apparatus for the Yakima-Kennewick project of the United States Reclamation Service, and a number of awards for primary and auxiliary equipment are being made to General Electric Company, Newport News Shipbuilding & Dry Dock Company, Worthington Pump & Machinery Company, Pennsylvania Transformer Company, Graybar Electric Company and others; a fund of $440,000 is available for the power development and $196,000 for the distributing system. General Electric Company is the successful bidder for induction regulators for the Modesto irrigation district in California.

The Philadelphia & Reading Railway, Philadelphia, Pa., is arranging an electrification and construction program to cost over $4,000,000; work will include electrifying of the passenger service system to Norristown and vicinity, to cost $1,500,000; purchase of about 30 electric passenger coaches, $1,500,000; conversion of present steam passenger coaches into electric units, $400,000, and miscellaneous work. Capital Traction Company, Washington, D. C., will expend over $600,000 in modernizing its electric street car lines and equipment, including purchase of a number of new cars. A New York manufacturer has secured an order from a steam railroad for electric car equipment, totaling $300,000, and has taken a contract for similar apparatus for other lines.

CONSTRUCTION PROJECTS

New York Central Railroad Company, New York, is completing plans for a multi-story freight terminal on the west side, to cost over $10,000,000. Underwood Typewriter Company, New York, contemplates plant at or near Toronto, Ont., reported to cost close to $100,000. Commissioner of Correction, Albany, N. Y., plans buildings and improvements at Elmira, N. Y., reformatory, including shop unit, to cost $1,300,000. East Orange, N. J., authorized installation of central office fire alarm system to cost $35,000. Board of Education, Newark, N. J., will receive bids until December 9 for electrical supplies, electric time clock, manual training equipment, etc. Department of City Transit, Philadelphia, Pa., will receive bids until December 18 for miscellaneous equipment for Ridge Avenue and Eighth Street subway. United States Treasury Department, Washington, D. C., authorized plans for Appraisers' Stores buildings at Baltimore, Md., to cost $1,000,000. General Purchasing Officer, Panama Canal, Washington, D. C., will receive bids until December 11 for insulated wire, plugs and other supplies (Schedule 2705).

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MIDDLE WEST

—SOME SLIGHT IMPROVEMENT *in general business is observed this week in this section. While the improvement is admittedly small and not well defined, it is felt that a little change for the better occurred.*

—PROSPECTS FOR *any general betterment this month are, at this time, not very promising. All that is hoped for is that business will continue at its present rate of activity until the close of the year.*

Rumors of increased activity in the steel and automotive field are encouraging, but as yet they are only rumors. Here and there some increased industrial activity is observed, but the field is about equally divided, favorably and unfavorably. Several of the railroads have experienced a less than seasonal decline in revenue carloadings, while others have suffered a sharp decline. Retail trade is receiving the first effects of holiday purchasing, and while the season is not expected to equal last year at all, it is starting in fairly well. While the production of electrical energy compares favorably with a similar period last year, general utility construction work has fallen off to a marked degree.

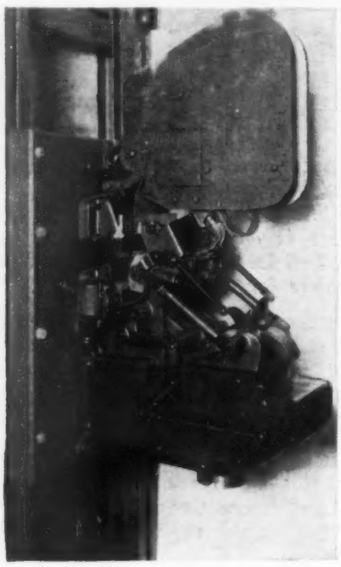
CONSTRUCTION PROJECTS

United States Treasury Department, Washington, D. C., is asking bids until December 18 for an addition to post office at Beloit, Wis., to cost $270,000. Michigan State College, East Lansing, Mich., will receive bids until December 10 for power plant equipment, including stokers, boilers, pulverized fuel equipment, etc. Republic Steel Corporation, Youngstown, Ohio, plans strip mill at plant at Massillon, Ohio, to cost $500,000. Duluth, Minn., will receive bids until December 16 for electric lamp requirements for city during 1932. Mountain States Power Company, Casper, Wyo., approved construction of transmission line at Forsyth, Mont., and vicinity, to cost $50,000.

New Equipment Available

Trip-Free Circuit Breakers Have Silver Contacts

A LINE OF single-pole, solenoid-operated air circuit breakers for 650-volt, d.c., 1,200 to 10,000-amp. service, designated type MC-5, has been announced by the General Electric Company. They are built for general use and are applicable for use in steel mills and automatic substations where service conditions are severe and operation is frequent.



The breakers are trip-free and consist of silver-to-silver self-aligning main contacts, secondary arcing contacts, an arc chute with magnetic blowout, overcurrent trip and direct-acting undervoltage or shunt trip. The normal rating of these breakers is based on a temperature rise of 20 deg. C. on the contacts.

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Steam Flow Controls Feedwater Flow

IN ORDER TO PROVIDE adequate feedwater control for modern steam-generating units having relatively small drum water-storage capacity and where rating changes are often rapid, a quick-acting feedwater control system is imperative.

A three-element feedwater control system has recently been developed by the Bailey Meter Company, Cleveland, Ohio, to meet the stringent requirements of present-day boilers. The three elements from which this control is operated are steam flow from the boiler, feedwater flow to the boiler and water level in the boiler drum. In order to nullify the effect of "swell" and to maintain the rate of feedwater input more nearly equal to the rate of steam output, this control functions primarily from steam flow, but is modified slightly by water level when necessary, to hold the level within the desired limits. The three elments of steam flow, feedwater flow and boiler water level are co-ordinated by means of linkage, to operate a Selsyn sending device through a torque amplifier. This amplifier, controlled by the movement of the connecting linkage between the three elements, turns the Selsyn sending unit at a rate proportional to the requirements for feedwater. The receiving Selsyn motor, mounted on the flow-regulating valve in the feedwater line, accurately follows every movement of the sending Selsyn and in doing so moves a pilot valve in the flow-regulating valve from its neutral position.

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Explosion-Proof Across-the-Line Starter

A MOTOR STARTER known as the No. 1 type ZEO across-the-line explosion-proof starter, which has been officially approved by the Underwriters' Laboratories for class 1, group D hazardous locations, is announced by the Electric Controller & Manufacturing Company, Cleveland, Ohio. The inclosing case is strong and tight enough to prevent the transmission of any flame that may occur within the case to surrounding atmosphere and the flanged joint between the upper and lower parts of the case is of sufficient length to cool any gases formed within before they can come in contact with the surrounding atmosphere.

The contactor mechanism and overload relays are mounted on a removable slate base. The maximum ratings of this starter are 5 hp., 110 volts, and 10 hp., 220, 440 and 550 volts.

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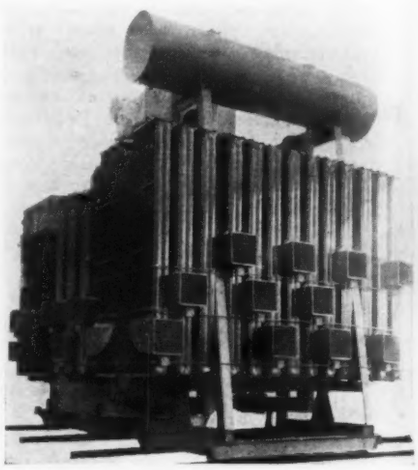
A NEW PRINCIPLE OF FUSE CONSTRUCTION is introduced by the Associated Engineers Company of Chicago in a renewable fuse, to be known by its trademark "AE." The design of this fuse departs completely from the use of nuts, bolts and washers as a means of making link and terminal contact. The link is formed to fit on a rigid asbestos carrier, positive link and terminal contact being made by terminal pin abutment. A part of the carrier projects between the calibrated portions of the link, making an effective arc barrier between the link's main sections.

Surge-Proof Construction Power Transformers

SURGE-PROOF CONSTRUCTION for high-voltage shell-type power transformers, with important improvements in the design of the insulation, has been announced by the Westinghouse Electric & Manufacturing Company. Not only



are surge voltages distributed uniformly throughout the winding in these transformers, but the winding and insulation are so designed that the voltage stresses in the insulation are substantially uniform throughout the entire insulation structure.

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Oil Pressure System for Hydraulic Presses

AN OIL PRESSURE SYSTEM developed for the operation of the H-P-M hydraulic presses of the general utility type is announced by the Hydraulic Press Manufacturing Company, Mount Gilead, Ohio. This method of operation not only allows for complete control over press performance but increases the speed at which the press works.

The H-P-M operating system consists of a rotary-type, low-pressure oil pump which advances the ram to the work more rapidly and a radial-type, high-pressure oil pump which builds up full working pressure to drive the press ram. The complete operating cycle is governed through a single manual control which when in neutral position indicates the ram as in neutral position.

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A HOOK TYPE LIVE LINE CLAMP of new design is announced by the Johnson Manufacturing Company, Atlanta, Ga. It is constructed for use with standard clamp stick and is made in two sizes, Nos. 6 to 2 and Nos. 2 to 4/0. It is made without solder and is very easy to attach to the line.